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UNITED STATES DEPARTMENT OF AGRICULTURE

BULLETIN No. 481

Contribution from the Forest Service
HENRY S. GRAVES, Forester

Washington, D. C. ▼ May 11, 1917

THE STATUS AND VALUE OF FARM WOODLOTS IN THE EASTERN UNITED STATES

By

E. H. FROTHINGHAM, Forest Examiner

CONTENTS

	Page
Woodlots of the Eastern States	1
How the Growth of Farming has Affected the Woodlot	3
Thirty Years' Change in Woodlot Area	11
Increase in Value of Woodlot Products	23
Amount and Quality of Woodlot Timber	23
What the Woodlot Promises for the Future	25
Woodlots and Community Forests	27
Woodlots and Public Forests	28
The Woodlot as a Farm Resource	29
Home Supply	34
Protection	37
As a Poor-land Crop	39

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	Page.		Page.
Woodlots of the Eastern States	1	What the woodlot promises for the future	25
How the growth of farming has affected the woodlot	3	Woodlots and community forests	27
Thirty years' change in woodlot area	11	Woodlots and public forests	28
Increase in value of woodlot products	23	The woodlot as a farm resource	29
Amount and quality of woodlot timber	23	Home supply	34
		Protection	37
		As a poor-land crop	39

WOODLOTS OF THE EASTERN STATES.

In the farming sections of the eastern States [1] the farm woodlot is a conspicuous feature. Small woodlots are almost always in sight, and sometimes fill so much of the view that they seem more extensive than the greater areas of cultivated land which are shut off by the screen of trees. In the longer settled regions and near the prairies the woodlots are relatively small and scattered; but as the topography grows rougher or a region is approached in which the farmer is really a pioneer settler, the woodlots increase in size until they become indistinguishable from the forest. The average size varies from about 5 acres in the older farming sections to 150 or 180 acres in the newer ones, such as northern Minnesota and one coast county of South Carolina. For the eastern States, as a whole, the Thirteenth Census (1910) showed the average size to be a little less than 30 acres.[2]

[1] Except where the contrary is specified, this bulletin deals only with the States as far west as, and including, Minnesota, Iowa, Missouri, Arkansas, and Louisiana. The southern part of Florida (21 counties) is excluded.

[2] Since the statistics do not show the number of farms with woodlots and the number without, it is necessary to assume that every farm has one. As a matter of fact, there are many farms with little or no timber growth, especially in the longer-settled and the prairie regions, so that the average woodlot is really a little larger.

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Considering the small size and the separate ownership of the woodlots, which has prevented their exploitation by any systematic plan such as is used in large-scale lumbering, the aggregate income which the farmers receive every year from the sale of their woodlot products is surprisingly large. In 1909,[1] for example, it amounted in the eastern States alone to nearly $170,000,000—more than the value of the entire potato crop in the East, nearly double that of the tobacco crop, and over twice that of the combined barley and rye crops. This income, however, can not be regarded as a perpetual income; it is secured very largely through the destruction of the woodlot in clearing land for cultivation. While the aggregate income from the sale of farm wood was increasing over 90 per cent between 1880 and 1910, the aggregate area of the woodlots was decreasing nearly 15 per cent, or at a rate of one-half of 1 per cent per year. A still further reduction in woodlot area must be regarded as inevitable. Although such a reduction, if carried to an extreme, would mean the loss of a convenient and cheap local timber supply for the farms, yet when the land cleared is at once devoted to raising more paying crops the removal of farm timber is entirely justifiable and desirable.

However the woodlots may be reduced in area, they will not disappear; for timber can be made an actively growing crop, often capable of yielding better returns than any other that can be grown on the poorer soils and situations of the farm. By proper management the quantity of wood products raised within a given time can be increased and the quality improved, and the woodlot can either be put on a self-sustaining basis and made to yield a few trees every year or every few years, or it can be clean-cut and reproduced at intervals of from 30 to 50 years so as to yield large returns on a relatively small investment. The farmer has a certain advantage over the lumberman who might wish to grow timber in that the funds invested in his timber are smaller in the aggregate, while the benefits to be secured are varied, and the labor that is necessary can be supplied by farm hands and teams when otherwise they would be idle. As a region becomes settled it becomes easier for the farmer to market his woodlot products profitably, because markets are more numerous and more accessible by good roads or railroads. Furthermore, the woodlot is the source of a great many indirect benefits to the farm, which are often themselves sufficient to warrant its being maintained permanently.

The purpose of this bulletin is to show as nearly as it can be done from available census statistics what the relation of the woodlot has been to the agricultural development of different parts of the East,

[1] Thirteenth Census.

what the tendencies appear to be, and, in general, what value the woodlot actually has to the Nation, the rural community, and the individual farm. As a means of reasonably complete and convenient assembling of the facts the farm land of the eastern United States will be considered in six divisions, each consisting of the counties having similar ratios of woodland to total farm land according to the Thirteenth Census (1910). These divisions, shown graphically on the map on pages 4 and 5, are as follows: Division I, less than 10 per cent of the total farm land wooded; Division II, from 10 to 20 per cent wooded; Division III, from 20 to 40 per cent wooded; Division IV, from 40 to 60 per cent wooded; Division V, from 60 to 80 per cent wooded; and Division VI, more than 80 per cent wooded. These divisions should not be mistaken as indicating the proportion of the total land surface which is in farms nor the general timbered condition of the region, although incidental relations between these and the proportion of farm land wooded do exist, as will be shown further on. All areas of county size or over are shown.[1] The tables in the bulletin are based on these divisions, so that the chief facts relating to the status of woodlots in any part of the Eastern States can easily be ascertained by first finding on the map in what woodlot division the area in question is located and then obtaining from the tables the data for that division and State.

HOW THE GROWTH OF FARMING HAS AFFECTED THE WOODLOT.

The history of the woodlot is a part of the history of agriculture in general; the status of farming in most regions and the extent and character of the farm woodland have been so related that if one were known the other could be determined with a fair degree of accuracy. Thus in most parts of the East the early stages of farming involved a bitter struggle with the timber, and only a small area was actually cleared; then, in proportion as settlement progressed, more and more of the wooded area was claimed for cultivation, until, in the long-settled farming lands of the north central States, the woodlot is now either a mere fragment of the original forest or a new growth which has been allowed to spring up in place of the old. Meanwhile there has always been a frontier of development (as there is now in the northern parts of the Lake States) where the newly acquired farm land is still mainly woods, and as this frontier has advanced it has left behind it regions representing progressive stages in the clearing process having smaller and smaller propor-

[1] The tables do not include statistics for the District of Columbia, and tables 1, 2, 3, and 5 also exclude those for counties whose location and average farm-land values showed that the land probably had a speculative value far in excess of its actual productive value for farm crops. In the aggregate this is a very small area.

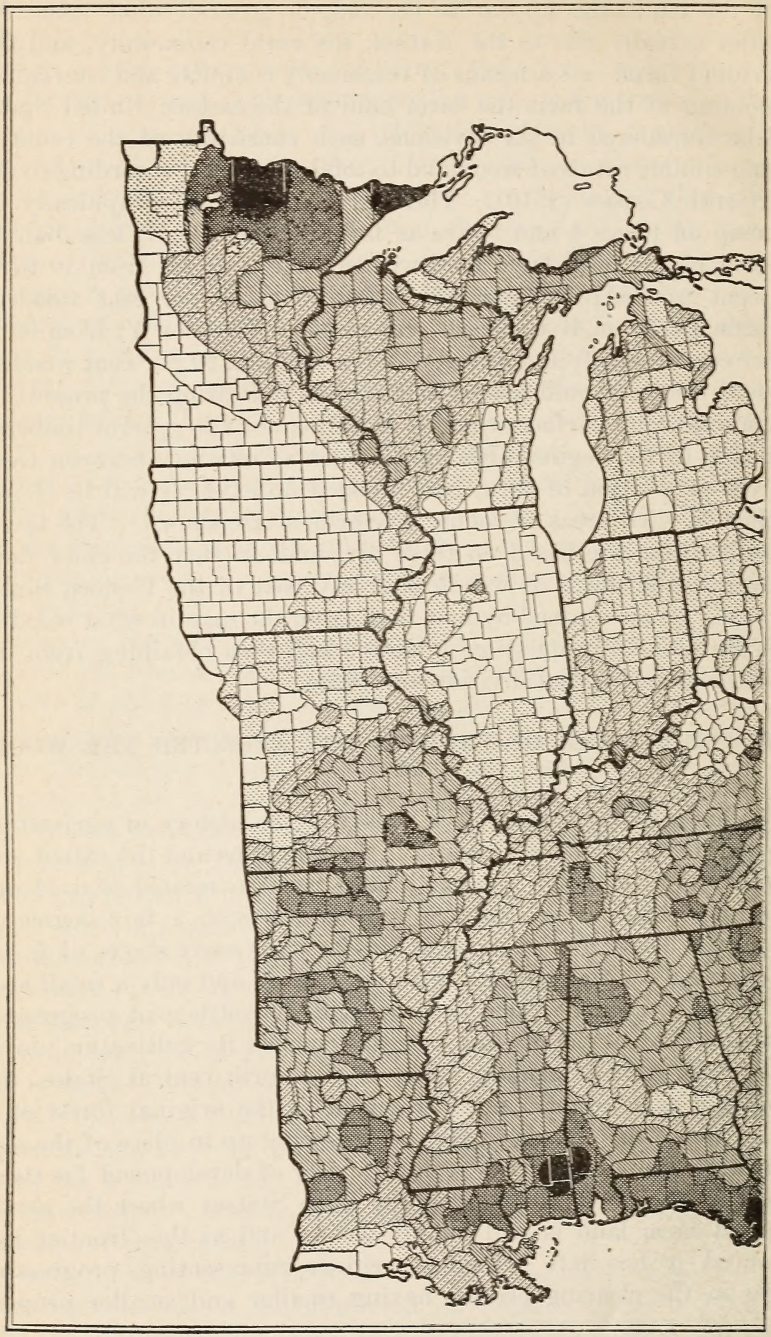
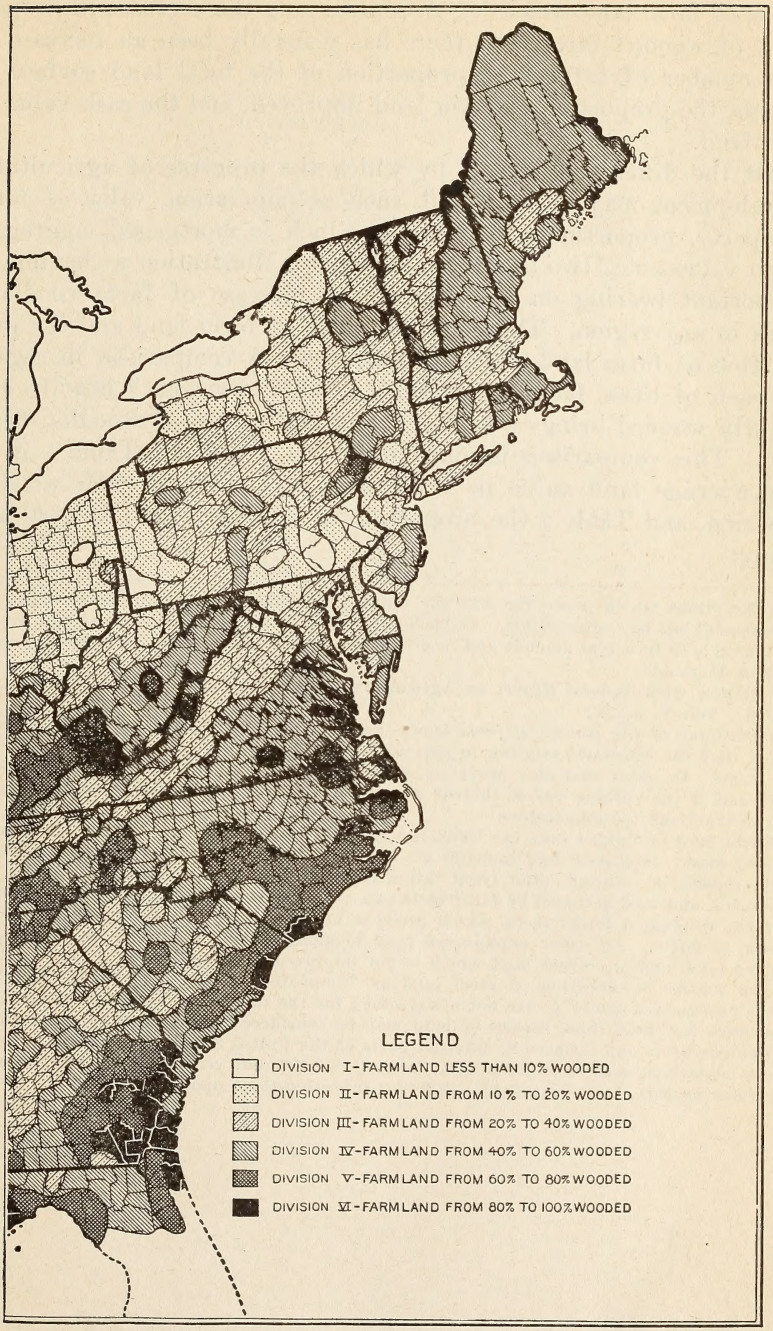


FIG. 1.—Land area of the Eastern States classified according to the proportion of farm indicate the proportion of the total land surface which is in farms (shown in Table 3); areas (Division I) the greatest proportion of the total land surface in farms.


LEGEND
DIVISION I-FARMLAND LESS THAN 10% WOODED
DIVISION II-FARMLAND FROM 10% TO 20% WOODED
DIVISION III-FARMLAND FROM 20% TO 40% WOODED
DIVISION IV-FARMLAND FROM 40% TO 60% WOODED
DIVISION V-FARMLAND FROM 60% TO 80% WOODED
DIVISION VI-FARMLAND FROM 80% TO 100% WOODED

land wooded (woodlot divisions). See Table 7. The degree of shading is not meant to the black areas (Division VI) usually contain, in fact, the smallest, and the unshaded

tions of farm land wooded.[1] Accompanying the decrease in proportion of wooded farm land there has generally been an increase in the number of farms, the proportion of the total land surface in farms, the proportion of farm land improved, and the cash value of the land.

Of the different elements by which the progress of agricultural development may be measured, such as population, value of farm property, proportion of this value which is mortgaged, aggregate crop values, etc., two have been chosen for illustration as having an important bearing on the decrease or increase of farm-woodland area in any region. These are the value of farm land and the proportion of farm land which is improved. A comparison in regard to each of these factors between "woodlot divisions" heavily and lightly wooded brings out clearly the real causes of woodlot clearing. This comparison is made in Tables 1 and 2. Table 1 gives the average land value in 1910 for the counties in each woodlot division, and Table 2 the proportion of improved land in 1880 and 1910.[2]

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[1] Exceptions which prove the rule are found in regions in which argiculture has not progressed, but has retrograded. In such cases farm woodlands have practically always increased both in actual amount and in proportion to total farm land. A notable example is New England.

[2] Extract from General Report on Agriculture, Thirteenth Census of the United States (1910), Vol. V, p. 25:

Definitions of the classes of farm land.—Section 8 of the Thirteenth Census act provided that the schedules relating to agriculture should call for the acreage of woodland on farms. In order that this provision might be carried into effect, definitions of farm land and of the various classes thereof were given in substantially the following form in the instructions to enumerators:

Farm land is divided into (1) improved land, (2) woodland, and (3) all other unimproved land. *Improved land* includes all land regularly tilled or mowed, land pastured and cropped in rotation, land lying fallow, land in gardens, orchards, vineyards, and nurseries, and land occupied by farm buildings. *Woodland* includes all land covered with natural or planted forest trees, which produce, or later may produce, firewood or other forest products. *All other unimproved land* includes brush land, rough or stony land, swamp land, and any other land which is not improved or in forests.

The census classification of farm land as "improved land," "woodland," and "all other unimproved land" is one not always easy for the farmers or enumerators to make. Statistics for these three classes of land may be considered fairly close approximations, but enumerators and farmers in different parts of the United States may have interpreted these definitions somewhat differently, and at the different censuses they may, even in the same locality, have put slightly different interpretations upon them.

TABLE 1.—*Average value of farm land, 1910.*

State or State group.	Average value per acre of farm land.						
	Division I.	Division II.	Division III.	Division IV.	Division V.	Division VI.	Total.
Eastern United States	$78.25	$51.17	$24.29	$14.20	$10.22	$7.34	$36.39
New England	[1] 14.43	50.70	22.78	15.62	.....	.....	19.18
Middle Atlantic	61.08	34.42	23.24	16.67	13.57	.....	30.77
North Central	93.45	61.36	33.55	16.77	8.20	.....	67.93
Lake States	44.58	42.91	28.95	21.65	12.93	9.94	37.62
South Atlantic	60.35	39.94	23.07	15.71	11.55	7.41	17.78
South Central	44.03	30.72	19.67	11.23	8.15	6.63	16.10
New England:							
Maine	.....	.....	11.55	14.26	.....	.....	13.73
New Hampshire	.....	.....	.....	13.70	.....	.....	13.70
Vermont	.....	32.28	12.56	10.64	.....	.....	12.52
Massachusetts	[1] 14.43	16.73	36.57	32.08	.....	.....	35.33
Rhode Island	.....	83.91	97.21	26.18	.....	.....	33.86
Connecticut	.....	.....	35.86	17.89	.....	.....	33.03
Middle Atlantic:							
New York	64.20	28.49	21.31	17.89	.....	.....	27.20
New Jersey	.....	48.12	47.91	34.05	.....	.....	47.34
Pennsylvania	58.91	39.72	22.38	12.97	13.57	.....	32.67
North Central:							
Ohio	68.11	52.86	19.04	19.47	.....	.....	53.34
Indiana	74.85	71.00	30.09	14.29	.....	.....	62.36
Illinois	118.41	63.63	35.79	37.48	.....	.....	95.02
Iowa	86.22	74.85	51.73	.....	.....	.....	82.58
Missouri	66.07	54.54	34.16	16.38	8.20	.....	41.68
Lake States:							
Michigan	34.74	35.73	18.68	15.25	17.41	.....	32.48
Wisconsin	69.08	64.88	31.65	22.28	.....	.....	43.30
Minnesota	41.87	38.71	29.07	22.90	12.72	9.94	36.82
South Atlantic:							
Delaware	.....	52.62	28.10	.....	.....	.....	33.63
Maryland	.....	37.64	38.08	15.21	.....	.....	32.15
Virginia	.....	36.11	28.04	15.15	11.67	.....	20.13
West Virginia	60.35	41.33	20.07	14.63	22.49	33.42	20.65
North Carolina	.....	.....	24.38	16.77	11.08	4.56	15.29
South Carolina	.....	.....	23.98	21.01	11.75	5.67	19.89
Georgia	.....	.....	16.90	12.93	11.45	5.13	13.74
Florida (26 northern counties)	.....	.....	9.26	10.03	9.05	18.25	10.12
South Central:							
Kentucky	45.74	36.57	16.62	8.64	9.31	.....	21.83
Tennessee	.....	42.01	24.75	11.64	9.07	.....	18.53
Arkansas	.....	38.70	24.84	13.54	6.95	.....	14.13
Alabama	.....	14.92	11.02	10.47	7.83	4.81	10.46
Mississippi	.....	27.19	19.34	9.13	8.56	9.19	13.69
Louisiana	29.99	33.05	23.37	13.58	8.32	.....	17.99

[1] Nantucket Island, Mass., only.

TABLE 2.—*Proportion of farm land improved, 1910 and 1880.*

State or State group.	Proportion of farm land improved.													
	Division I.		Division II.		Division III.		Division IV.		Division V.		Division VI.		Total.	
	1910	1880	1910	1880	1910	1880	1910	1880	1910	1880	1910	1880	1910	1880
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Eastern United States	87.7	80.2	77.9	71.7	59.2	52.5	43.7	34.8	29.2	18.0	12.5	8.8	62.4	54.6
New England	40.2	29.8	65.5	74.5	39.9	67.8	33.7	55.3	.....	.....	.....	.....	36.8	61.2
Middle Atlantic	87.0	85.9	74.4	78.7	60.9	64.9	47.5	49.3	15.2	23.7	.....	.....	67.9	71.5
North Central	89.7	84.0	81.4	72.3	67.9	59.2	46.3	34.2	32.1	25.1	.....	.....	80.8	73.3
Lake States	82.5	64.0	71.2	64.6	51.1	43.6	34.8	34.3	14.8	26.3	7.3	6.0	65.6	58.0
South Atlantic	79.0	78.3	79.9	74.8	60.6	47.0	44.7	33.5	29.2	17.3	12.6	8.3	47.1	35.8
South Central	85.8	76.9	77.1	59.7	62.2	45.9	45.0	29.9	30.0	18.9	12.9	12.6	52.4	38.2
New England:														
Maine	.....	.....	.....	.....	40.9	66.3	36.7	50.2	.....	.....	.....	.....	37.5	53.2
New Hampshire	.....	.....	.....	.....	.....	.....	28.6	62.0	.....	.....	.....	.....	28.6	62.0
Vermont	.....	.....	72.9	79.3	34.8	69.4	33.3	54.3	.....	.....	.....	.....	35.0	67.3
Massachusetts	40.2	29.8	25.9	54.5	42.6	66.4	34.3	55.3	.....	.....	.....	.....	40.4	63.4
Rhode Island	.....	.....	73.8	83.1	63.3	76.2	35.6	54.3	.....	.....	.....	.....	40.2	58.0
Connecticut	.....	.....	.....	.....	47.0	67.4	35.6	64.5	.....	.....	.....	.....	45.2	66.9
Middle Atlantic:														
New York	88.0	86.1	72.0	80.1	62.5	70.3	44.2	50.9	.....	.....	.....	.....	67.4	74.5
New Jersey	.....	93.4	78.7	80.4	60.9	66.1	46.4	34.5	.....	.....	.....	.....	70.1	71.6
Pennsylvania	86.3	85.8	76.7	76.5	59.0	58.2	51.7	49.8	15.2	23.7	.....	.....	68.2	67.8
North Central:														
Ohio	86.8	79.8	79.6	73.5	65.3	62.1	50.1	50.0	.....	.....	.....	.....	79.8	73.7
Indiana	87.8	74.8	82.3	69.2	67.1	62.7	51.5	44.3	.....	.....	.....	.....	79.5	68.2
Illinois	90.6	88.8	81.4	73.9	70.4	60.4	55.7	39.9	.....	.....	.....	.....	86.2	82.5
Iowa	89.5	82.2	80.9	78.1	67.9	65.2	.....	.....	.....	.....	.....	.....	86.9	80.3
Missouri	90.8	78.5	83.2	69.8	68.3	54.2	45.8	32.9	32.1	25.1	.....	.....	71.1	60.1
Lake States:														
Michigan	76.5	69.2	72.0	62.1	46.7	30.9	36.7	14.3	19.1	.....	.....	.....	67.7	60.1
Wisconsin	74.6	82.4	70.6	69.6	50.9	47.2	34.0	33.0	.....	.....	.....	.....	56.5	59.7
Minnesota	84.8	55.7	69.6	65.3	53.3	40.0	35.9	44.2	14.5	26.3	7.3	6.0	71.0	54.1
South Atlantic:														
Delaware	.....	.....	79.3	83.6	65.6	63.9	.....	.....	.....	.....	.....	.....	68.7	68.5
Maryland	.....	.....	80.9	78.8	67.3	65.5	50.0	50.6	.....	.....	.....	.....	66.3	65.3
Virginia	.....	.....	80.8	77.2	62.3	51.0	43.5	38.2	32.9	22.7	.....	.....	50.6	42.9
West Virginia	79.0	78.3	78.5	67.6	65.0	44.5	44.3	26.7	28.9	13.2	13.6	9.6	55.1	37.2
North Carolina	.....	.....	.....	.....	56.6	43.3	43.4	33.1	29.0	20.2	12.2	5.9	39.3	29.0
South Carolina	.....	.....	.....	.....	54.8	39.0	45.8	30.1	30.4	17.0	10.3	9.6	45.1	30.7
Georgia	.....	.....	.....	.....	58.7	43.5	46.1	31.7	29.1	12.3	13.0	8.6	45.6	31.5
Florida (26 northern counties)	.....	.....	.....	.....	63.4	56.8	47.7	33.3	24.5	22.0	11.0	7.3	39.4	31.5

South Central:														
Kentucky	88.3	79.8	78.8	64.9	67.9	50.6	49.6	33.2	29.8	12.7	.....	.....	64.7	49.9
Tennessee	.....	.....	82.5	48.7	64.1	51.6	45.4	32.1	29.6	19.7	.....	.....	54.3	41.1
Arkansas	.....	.....	79.3	41.5	62.1	33.9	46.7	29.5	31.8	26.4	.....	.....	46.4	29.8
Alabama	.....	.....	71.8	59.7	57.2	42.1	43.1	28.2	30.1	18.5	12.5	13.8	46.8	33.8
Mississippi	.....	.....	75.6	44.6	59.8	41.3	41.8	27.2	27.1	19.5	13.5	12.2	48.5	32.9
Louisiana	66.0	36.3	79.7	50.1	57.6	38.9	45.7	31.1	29.1	18.4	.....	.....	50.5	33.1

TABLE 3.—*Proportion of total land area in farms, 1910 and 1880.*[1]

State or State group.	Division I.		Division II.		Division III.		Division IV.		Division V.		Division VI.		Total.	
	1910	1880	1910	1880	1910	1880	1910	1880	1910	1880	1910	1880	1910	1880
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Eastern United States	90.5	72.6	84.7	79.8	68.2	63.1	57.3	51.5	43.2	37.4	28.2	22.6	67.8	60.7
New England	[2] 9.5	59.7	51.2	62.8	75.2	81.0	38.2	42.0	.....	.....	.....	.....	49.7	54.2
Middle Atlantic	83.8	92.8	81.8	87.3	59.9	65.3	39.0	43.8	49.8	40.2	.....	.....	67.1	72.7
North Central	93.7	78.3	91.9	88.0	85.7	76.9	64.1	44.0	43.8	14.7	.....	.....	89.0	78.5
Lake States	88.1	52.8	73.7	58.3	52.2	28.9	21.7	7.1	7.1	.1	3.3	[3]	54.6	34.4
South Atlantic	86.9	[4]	89.2	91.8	78.8	80.5	71.7	69.6	51.3	49.3	37.7	34.3	67.7	66.7
South Central	73.7	71.0	73.7	69.6	68.2	63.7	61.3	53.1	44.7	35.9	31.6	14.3	61.6	54.7
New England:														
Maine	.....	.....	.....	.....	82.5	82.7	28.8	30.2	.....	.....	.....	.....	32.9	34.2
New Hampshire	.....	.....	.....	.....	.....	.....	56.2	64.4	.....	.....	.....	.....	56.2	64.4
Vermont	.....	.....	93.7	94.2	85.5	88.4	55.6	62.9	.....	.....	.....	.....	79.9	83.6
Massachusetts	[2] 9.5	59.7	19.0	35.9	61.5	71.0	46.0	54.0	.....	.....	.....	.....	55.8	65.3
Rhode Island	.....	.....	64.7	77.2	62.2	82.9	65.0	75.0	.....	.....	.....	.....	64.9	75.4
Connecticut	.....	.....	.....	.....	71.1	80.0	69.5	76.6	.....	.....	.....	.....	70.9	79.5
Middle Atlantic:														
New York	85.5	98.1	83.3	88.8	66.5	73.0	41.5	47.9	.....	.....	.....	.....	71.5	78.0
New Jersey	.....	10.6	71.5	77.2	50.5	59.3	16.4	24.9	.....	.....	.....	.....	53.5	60.9
Pennsylvania	82.6	90.2	82.2	87.5	54.9	58.8	43.1	44.7	49.8	40.2	.....	.....	64.7	69.0
North Central:														
Ohio	92.8	95.3	93.5	94.5	85.4	91.2	69.3	69.1	.....	.....	.....	.....	92.5	94.1
Indiana	90.9	81.2	93.4	89.6	90.4	90.3	86.6	78.8	.....	.....	.....	.....	92.3	88.5
Illinois	92.1	92.9	89.3	83.7	84.0	69.3	86.7	85.3	.....	.....	.....	.....	90.7	88.3
Iowa	95.4	63.4	95.4	91.2	94.3	88.1	.....	.....	.....	.....	.....	.....	95.4	69.6
Missouri	93.5	80.1	89.1	80.0	82.1	66.7	63.2	42.0	43.0	14.7	.....	.....	78.6	63.4

[1] In Division I the portion of the land not in farms is chiefly in town and city sites, railroad rights of way, estates, factories, etc. In the other divisions the greater areas not in farms are occupied, in addition to town sites, etc., by commercial forests, brushland, cut over and burned land, swamps, sand plains, mountainous or hilly land, and other types of land of greater or less promise for agriculture. In the eastern mountains, the Lake States, and many parts of the South, small percentages of farm land indicate large amounts of standing timber, and in these sections lumbering is, for the time being at least, much more important than farming.

[2] Nantucket Island, Mass., only.

[3] Less than one-twentieth of 1 per cent.

[4] Total farm land more than recorded grand total land area.

TABLE 3.—*Proportion of total land area in farms, 1910 and 1880*—Continued.

State or State group.	Division I.		Division II.		Division III.		Division IV.		Division V.		Division VI.		Total.	
	1910	1880	1910	1880	1910	1880	1910	1880	1910	1880	1910	1880	1910	1880
Lake States:	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Michigan	85.5	72.4	71.4	57.0	30.4	11.9	8.9	2.5	5.0	.....	.....	.....	51.5	37.5
Wisconsin	93.0	95.6	92.2	87.4	61.6	40.0	27.6	9.3	.....	.....	.....	.....	59.6	43.4
Minnesota	87.8	42.5	65.3	39.5	55.9	26.2	24.1	8.1	7.2	.1	3.3	(1)	53.5	25.9
South Atlantic:														
Delaware	.....	.....	84.2	91.2	82.2	85.4	.....	.....	.....	.....	.....	.....	82.6	86.7
Maryland	.....	.....	88.6	90.7	80.1	82.7	71.0	68.6	.....	.....	.....	.....	79.5	80.5
Virginia	.....	.....	94.2	91.9	76.8	79.6	75.4	75.2	67.3	75.5	.....	.....	75.6	77.0
West Virginia	86.9	(1)	89.1	93.1	86.4	81.1	56.1	60.8	35.1	35.7	37.8	30.0	65.2	66.3
North Carolina	.....	.....	.....	.....	81.6	84.6	82.2	78.2	57.4	61.4	53.0	64.7	71.9	71.7
South Carolina	.....	.....	.....	.....	80.0	83.2	68.9	72.2	59.7	47.4	42.8	47.9	69.2	69.0
Georgia	.....	.....	.....	.....	77.4	79.3	74.8	67.8	72.4	70.7	43.1	36.9	71.7	69.3
Florida (26 northern counties)	.....	.....	.....	.....	44.1	51.9	45.7	35.7	14.8	6.4	13.5	10.8	26.0	18.0
South Central:														
Kentucky	92.8	93.5	91.1	92.7	88.1	82.0	81.5	76.7	76.9	79.7	.....	.....	86.3	83.6
Tennessee	.....	.....	74.8	91.3	87.0	86.5	70.0	73.1	46.6	57.3	.....	.....	75.1	77.5
Arkansas	.....	.....	37.0	28.6	48.5	34.3	54.2	39.5	47.9	26.5	.....	.....	51.8	35.9
Alabama	.....	.....	71.9	76.3	72.7	77.4	64.3	54.6	43.4	35.4	49.5	9.6	63.2	57.5
Mississippi	.....	.....	67.6	63.1	67.5	59.3	68.7	59.4	37.3	23.3	21.0	17.1	62.5	53.4
Louisiana	27.5	16.4	50.0	22.1	33.9	27.4	41.9	36.1	24.8	17.9	.....	.....	35.9	28.5

[1] Total farm land more than recorded grand total land area.

The general rate at which agricultural development took place between 1880 and 1910 is indicated in Table 3, which shows what proportion of the total land surface was in farms in each of these years. In New England a marked decrease took place, partly on account of the abandonment of rough, unprofitable farms. There was also a decrease in the Middle Atlantic States, and it is apparent that the States along the coast from Maine to New Jersey, having developed their farming land much earlier than the rest of the country, have tended since 1880 more toward industrial than agricultural development. Only in New England, however, has the decrease in the proportion of the total land surface in farms been accompanied by an increase in the proportion of farm land that is wooded.

THIRTY YEARS' CHANGE IN WOODLOT AREA.

The decrease in woodlot area from 1880 to 1890 (nearly 15 per cent) was most rapid in the three divisions which now have the smallest proportion of farm land in woods. This is shown in Table 4, which gives the acreage of woodland [1] in 1910 and the percentage of increase or decrease since 1880 for each State and division. For the eastern States as a whole, the decrease amounted to 37 per cent in Division I, 39 per cent in Division II, and 18.5 per cent in Division III; while in Division IV it was only 5.7 per cent, in Division V 0.8 per cent, and in Division VI no decrease at all, but an increase of nearly 19 per cent. In New England there were increases in Divisions III and IV, due chiefly to reforestation of abandoned fields. In the Lake States the great increases which took place in Divisions III, IV, V, and VI were due to the acquisition by settlers of portions of the timberlands in these regions, which, in their new status as farm woodland, are likely to repeat the history of the woodlots in the longer-developed regions.

[1] From the table it is easy to determine for any State or States which division has the most farm land. Thus, for the eastern States as a whole, and for New England, the South Atlantic, the South Central States, and Missouri, it is Division IV, with from 40 to 60 per cent of the farm area in woods. In Iowa it is Division I; in the Lake States, Division III; and in Ohio, Indiana, and Illinois, Division II.

TABLE 4.—*Total area of woodland on farms in 1910, and proportion of increase or decrease since 1880.*

[Minus signs in front of per cent figures indicate a decrease.]

State or State group.	Division I.		Division II.		Division III.		Division IV.		Division V.		Division VI.		Total.	
	Total woodland, 1910.	Increase or decrease since 1880.	Total woodland 1910.	Increase or decrease since 1880.	Total woodland, 1910.	Increase or decrease since 1880.	Total woodland, 1910.	Increase or decrease since 1880.	Total woodland, 1910.	Increase or decrease since 1880.	Total woodland 1910.	Increase or decrease since 1880.	Total woodland, 1910.	Increase or decrease since 1880.
	Acres.	*Per cent.*	*Acres.*	*Per cent.*	*Acres.*	*Per cent.*	*Acres.*	*Per cent.*	*Acres.*	*Per cent.*	*Acres.*	*Per cent.*	*Acres.*	*Per cent.*
Eastern United States	4,788,676	−37.0	15,640,534	−39.0	39,904,925	−18.5	59,366,026	− 5.7	20,869,796	− 0.8	2,820,666	18.8	143,391,568	−14.9
New England	[1] 266	166.0	19,725	−11.7	3,087,587	11.2	4,745,335	5.1					7,852,913	7.3
Middle Atlantic	303,157	−32.0	2,816,043	−21.8	4,968,089	−20.9	1,030,732	−18.1	137,559	33.7			9,255,580	−21.0
North Central	3,251,988	−35.8	8,397,153	−43.7	4,511,421	−21.0	4,347,977	13.0	528,594	166.2			21,037,133	−29.3
Lake States	942,600	−24.7	3,137,255	−35.6	5,691,286	32.8	1,948,932	135.5	424,110	[2]1936.4	83,342	[3]7799.6	12,227,525	8.7
South Atlantic	5,257	−52.2	481,432	−33.1	10,176,413	−25.4	22,949,203	− 9.3	12,046,484	− 9.8	2,242,931	3.4	47,902,665	−13.2
South Central	285,408	−64.6	788,926	−47.5	11,470,129	−29.5	24,343,847	−10.5	7,733,049	4.9	494,393	140.1	45,115,752	−15.4
New England:														
Maine					427,177	18.4	2,348,444	1.2					2,775,621	3.5
New Hampshire							1,502,389	15.9					1,502,389	15.9
Vermont			8,611	4.7	1,287,428	7.8	270,659	−10.0					1,566,698	4.2
Massachusetts	[1] 266	166.0	4,254	−40.5	762,206	10.3	297,827	− 2.7					1,064,553	6.0
Rhode Island			6,860	− 1.4	1,974	− 3.0	177,075	2.0					185,909	1.8
Connecticut					608,802	15.2	148,941	26.2					757,743	17.2
Middle Atlantic:														
New York	108,160	−27.0	1,465,436	−15.5	2,314,733	−12.7	547,816	−13.7					4,436,145	−14.6
New Jersey			207,233	−14.6	277,839	−19.4	52,924	−56.1					537,996	−24.0
Pennsylvania	194,997	−34.4	1,143,374	−29.6	2,375,517	−27.6	429,992	−14.6	137,559	33.7			4,281,439	−26.3
North Central:														
Ohio	373,771	−56.1	2,430,088	−45.6	364,183	−32.4	117,334	− 3.5					3,285,376	−45.1
Indiana	229,099	−58.3	1,858,305	−50.2	1,192,733	−23.1	90,654	−14.3					3,370,791	−43.2
Illinois	1,137,685	−35.7	1,500,469	−40.9	452,888	−17.4	56,837	−29.6					3,147,879	−36.2
Iowa	1,172,028	− 4.4	795,593	−27.0	346,494	−21.2							2,314,115	−16.0
Missouri	339,405	−49.2	1,812,698	−41.4	2,155,123	−18.2	4,083,152	15.3	528,594	166.2			8,918,972	−12.0
Lake States:														
Michigan	209,209	−53.9	1,698,043	−46.6	783,836	11.0	216,211	88.6	[4] 20,255	[4]			2,927,554	−34.2
Wisconsin	204,052	−43.8	755,023	−36.4	3,218,429	20.1	1,200,076	123.0					5,377,580	12.8
Minnesota	529,339	21.5	684,189	33.8	1,689,021	87.8	532,645	204.4	403,855	[2]1936.4	83,342	[3]7799.6	3,922,391	93.2
South Atlantic:														
Delaware			27,849	5.4	224,183	−11.3							252,032	− 9.7
Maryland			206,551	−18.2	693,231	−12.9	567,551	− 3.1					1,467,333	−10.2
Virginia			72,486	−13.9	2,365,849	−27.3	5,345,155	4.9	630,245	− 9.5			8,414,680	− 7.8
West Virginia	5,257	−52.2	174,546	−51.1	1,187,359	−39.3	2,110,784	−35.8	382,039	−19.5	108,851	19.4	3,968,836	−35.8
North Carolina					491,309	−28.1	6,981,574	− 3.7	4,752,074	−15.6	226,782	−25.6	12,451,739	−10.2
South Carolina					1,513,210	−16.5	2,866,349	−20.7	1,773,671	10.2	185,912	−14.6	6,339,142	−12.6

Georgia	.....	.....	.....	.....	3,648,182	−24.3	4,052,920	− 8.6	3,738,896	−18.6	1,562,743	9.7	13,002,741	−14.8
Florida (26 northern counties)	.....	.....	.....	.....	53,090	−27.0	1,024,870	.....	769,559	121.0	158,643	21.3	2,006,162	27.2
South Central:														
Kentucky	261,821	−66.2	405,431	−49.5	2,178,341	−33.6	2,555,184	−20.7	1,550,849	−23.3	.....	.....	6,951,626	−31.2
Tennessee	.....	.....	9,147	−74.9	3,205,625	−30.9	3,831,288	−25.6	961,673	−31.5	.....	.....	8,007,733	−28.7
Arkansas	.....	.....	25,186	−56.0	835,467	−24.1	5,507,455	1.2	2,143,402	70.3	.....	.....	8,511,510	8.3
Alabama	.....	.....	168,049	−40.9	2,012,514	−28.2	5,532,924	− 5.5	1,436,641	.3	294,636	462.4	9,444,764	− 9.5
Mississippi	.....	.....	109,095	−58.3	2,217,800	−29.7	4,463,158	− 9.7	893,748	41.0	199,757	30.1	7,883,558	−13.8
Louisiana	23,587	−26.4	72,018	20.7	1,020,382	−20.0	2,453,838	− 4.5	746,736	20.3	.....	.....	4,316,561	− 5.3

[1] Nantucket Island only.
[2] Increase is for St. Louis County, Minn., only; total area (1910) is for Beltrami, Itasca, and St. Louis counties.
[3] Increase is for Cook County, Minn., only; total area (1910) is for Cook and Koochiching counties.
[4] In Michigan the only county in Division V was Alger County, which had not been organized in 1880.

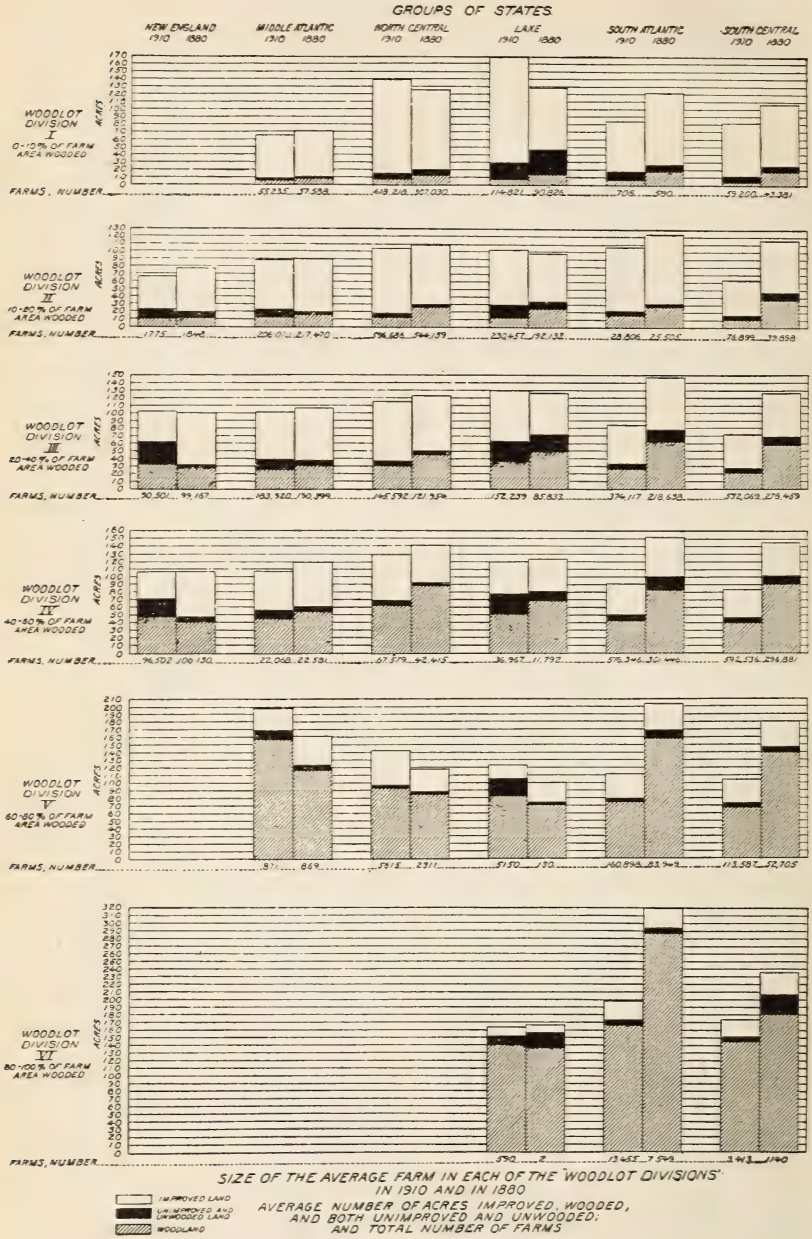
GROUPS OF STATES
NEW ENGLAND 1910 1880
MIDDLE ATLANTIC 1910 1880
NORTH CENTRAL 1910 1880
LAKE 1910 1880
SOUTH ATLANTIC 1910 1880
SOUTH CENTRAL 1910 1880
WOODLOT DIVISION I 0-10% OF FARM AREA WOODED
WOODLOT DIVISION II 10-20% OF FARM AREA WOODED
WOODLOT DIVISION III 20-40% OF FARM AREA WOODED
WOODLOT DIVISION IV 40-60% OF FARM AREA WOODED
WOODLOT DIVISION V 60-80% OF FARM AREA WOODED
WOODLOT DIVISION VI 80-100% OF FARM AREA WOODED
ACRES
FARMS, NUMBER
55,235 57,558 449,210 307,030 114,821 90,824 705 590 59,200 9,381
1,775 1,840 226,010 217,470 596,684 544,139 230,457 192,132 28,806 25,505 76,899 39,698
30,501 99,167 163,920 130,899 145,592 121,958 52,239 85,833 374,117 218,638 572,063 279,469
96,502 100,130 22,068 22,581 67,579 42,415 36,967 11,792 576,346 301,440 592,336 294,881
879 869 7,915 2,311 5,150 1,310 160,898 83,349 113,587 52,705
590 2 13,657 7,593 3,413 1,940
SIZE OF THE AVERAGE FARM IN EACH OF THE WOODLOT DIVISIONS IN 1910 AND IN 1880
IMPROVED LAND
UNIMPROVED AND UNWOODED LAND
WOODLAND
AVERAGE NUMBER OF ACRES IMPROVED, WOODED, AND BOTH UNIMPROVED AND UNWOODED; AND TOTAL NUMBER OF FARMS

FIG. 2.

In every State, except Minnesota and Massachusetts (Nantucket Island), there was a decrease in Division I; four States showed increases in Division II and two showed a marked falling off in Division VI.[1] In most of the States the decrease was more rapid in the small woodlot than in the large woodlot regions. In Iowa, where over half the farm woodland is in Division I, the reverse was the case; the decrease in Division I was only 4.4 per cent, while in the other two divisions represented it was 27 and 21.2 per cent, respectively. This would indicate that in Iowa the farmers appreciate the value of small woodlots more than in many other States. It is partly accounted for by the planting of prairie windbreaks and tree plantations.

Though the decrease in woodland has been caused chiefly by the need of land for cultivation or grazing, a great deal of farm land has been left unimproved when cleared. The area of unimproved unwooded farm land in the Eastern States, according to the census of 1910, is 40,429,951 acres,[2] or about 8 per cent of all farm land. Between 1880 and 1910 this land increased over 34 per cent in amount, while the increase in total farm holdings was less than 12 per cent. It is true that some of this increase, especially in regions like the northern part of the Lake States, can be accounted for by the acquisition by farmers of stump lands not yet in shape for cultivation. Some of it may be used for grazing, but not a large amount, for in taking the census statistics pasture land was usually classed as "improved." In the East, as a whole, it is probable that the greater part of this class of land has remained idle, partly because the farmer did not have the means to improve it and partly because it was too poorly drained, too steep, or too stony for successful cultivation.

The acreage of unimproved and unwooded land in 1910, its proportion to the total area of farm land, and the proportionate increase or decrease since 1880 are shown for each State and division in Table 5.

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[1] As is indicated by the blank spaces in the table, in some States there are no areas of county size in several of the divisions.

[2] This is the net amount after making the deduction referred to in the footnote on p. 3. The aggregate area of unimproved and unwooded farm land in these States, as given in the census of 1910, is 40,779,673 acres.

TABLE 5.—*Farm land unimproved and unwooded in 1910, and proportion of increase or decrease since 1880.*

[Minus signs in front of per cent figures indicate a decrease.]

State or State groups.	Division I.			Division II.		
	Unimproved and unwooded land, 1910.		Increase or decrease since 1880 (per cent).	Unimproved and unwooded land, 1910.		Increase or decrease since 1880 (per cent).
	Acres.	Per cent of total farm land.		Acres.	Per cent of total farm land.	
Eastern United States	5,757,569	6.7	− 3.9	9,161,884	8.1	116.0
New England	[1] 1,593	51.2	− 88.3	20,337	18.0	44.5
Middle Atlantic	164,819	4.6	83.4	1,868,968	10.2	241.5
North Central	2,731,269	4.7	1.6	3,172,487	5.1	103.7
Lake	2,453,616	12.6	− 16.2	3,648,043	15.5	113.5
South Atlantic	7,242	12.2	70.8	130,740	4.3	94.2
South Central	399,030	8.3	48.2	321,309	6.6	− 7.7
New England: [2]						
Vermont				4,866	9.8	128.6
Massachusetts	[1] 1,593	51.2	− 88.3	9,974	59.7	6.5
Rhode Island				5,497	11.7	113.5
Middle Atlantic:						
New York	68,512	4.7	18.5	1,244,867	12.9	283.9
New Jersey				96,836	6.8	61.2
Pennsylvania	96,307	4.5	201.4	527,265	7.3	223.7
North Central:						
Ohio	232,197	5.0	137.6	1,202,252	6.8	293.9
Indiana	107,664	3.9	44.4	599,256	4.3	65.5
Illinois	698,511	3.6	60.7	557,635	5.0	244.1
Iowa	1,587,121	6.0	− 14.8	392,288	6.3	87.6
Missouri	105,776	2.2	− 51.7	421,056	3.2	− 18.8
Lake:						
Michigan	344,117	18.9	113.1	2,003,239	15.2	142.2
Wisconsin	443,236	17.4	359.4	796,925	15.1	137.2
Minnesota	1,666,263	11.5	− 37.6	847,879	16.8	55.4
South Atlantic: [2]						
Delaware				20,729	8.8	37.1
Maryland				37,226	2.9	58.9
Virginia				7,500	1.8	− 9.3
West Virginia	7,242	12.2	70.8	65,285	5.9	218.4
South Central:						
Kentucky	243,537	5.6	139.4	126,833	5.0	40.9
Tennessee				1,063	1.8	785.8
Arkansas				3,345	2.4	− 35.4
Alabama				110,406	11.2	− 20.4
Mississippi				37,484	6.2	− 23.7
Louisiana	155,493	29.5	− 7.2	42,177	7.5	− 34.9

[1] Nantucket Island.
[2] The States in this group in which woodlot Divisions I and II are not represented are omitted.

TABLE 5.—*Farm land unimproved and unwooded in 1910, and proportion of increase or decrease since 1880*—Continued.

[Minus signs in front of per cent figures indicate a decrease.]

State or State group.	Division III.			Division IV.		
	Unimproved and unwooded land, 1910.		Increase or decrease since 1880 (per cent).	Unimproved and unwooded land, 1910.		Increase or decrease since 1880 (per cent).
	Acres.	Per cent of total farm land.		Acres.	Per cent of total farm land.	
Eastern United States	14,474,688	10.8	50.4	9,701,982	7.9	7.8
New England	2,457,056	26.6	486.1	2,127,359	20.5	271.4
Middle Atlantic	2,269,509	12.2	181.6	224,047	9.4	116.3
North Central	850,417	5.1	111.1	365,004	4.1	221.0
Lake	3,898,289	9.9	112.2	942,313	21.2	604.8
South Atlantic	2,216,915	7.0	− 33.9	3,100,898	6.6	− 39.4
South Central	2,782,502	7.4	− .8	2,942,361	5.1	− .7
New England:						
Maine	294,037	24.1	472.6	866,544	17.0	159.4
New Hampshire				817,884	25.2	601.9
Vermont	1,316,547	33.0	1,730.3	141,501	22.9	660.8
Massachusetts	477,612	22.1	225.6	156,939	22.6	175.2
Rhode Island	1,529	16.0	54.3	72,029	18.6	139.3
Connecticut	367,331	19.9	147.8	72,462	21.1	340.6
Middle Atlantic:						
New York	1,211,569	12.9	196.8	152,646	12.1	98.9
New Jersey	120,151	11.8	101.4	14,878	11.8	167.0
Pennsylvania	937,789	11.6	177.5	56,523	5.6	165.6
North Central:						
Ohio	137,270	9.5	193.7	20,644	7.4	29.6
Indiana	278,141	6.2	145.8	12,719	5.9	509.4
Illinois	64,496	3.7	181.4	6,093	4.3	87.9
Iowa	145,965	9.5	147.5			
Missouri	224,545	3.0	39.5	325,548	4.0	252.2
Lake:						
Michigan	729,325	25.7	1,055.5	100,660	20.1	1,462.6
Wisconsin	1,939,382	18.5	111.6	595,337	21.9	707.4
Minnesota	1,229,582	19.7	43.3	246,316	20.3	360.2
South Atlantic:						
Delaware	52,567	6.5	7.1			
Maryland	122,642	4.9	33.8	74,805	5.9	167.0
Virginia	314,745	4.4	− 12.7	858,331	7.8	− 48.7
West Virginia	168,927	4.4	172.6	283,239	6.6	130.7
North Carolina	92,948	6.9	− 14.9	819,405	5.9	− 46.0
South Carolina	495,835	11.2	− 51.0	468,840	7.6	− 47.2
Georgia	961,916	8.7	− 41.9	499,057	6.0	− 37.3
Florida (26 northern counties)	7,335	4.4	− 34.9	97,221	4.5	5.4
South Central:						
Kentucky	289,914	3.7	17.2	179,709	3.3	− 2.7
Tennessee	634,138	5.9	27.3	451,252	5.8	9.0
Arkansas	123,996	4.9	50.9	582,721	5.1	36.5
Alabama	640,146	10.3	− 37.1	690,488	6.3	− 15.0
Mississippi	716,177	10.2	17.1	818,326	9.0	6.0
Louisiana	378,131	11.5	8.0	219,865	4.5	− 37.6

TABLE 5.—*Farm land unimproved and unwooded in 1910, and proportion of increase or decrease since 1880*—Continued.

[Minus signs in front of per cent figures indicate a decrease.]

State or State group.	Division V.			Division VI.			Total.		
	Unimproved and unwooded land, 1910.		Increase or decrease since 1880 (per cent).	Unimproved and unwooded land, 1910.		Increase or decrease since 1880 (per cent).	Unimproved and unwooded land, 1910.		Increase or decrease since 1880 (per cent).
	Acres.	Per cent of total farm land.		Acres.	Per cent of total farm land.		Acres.	Per cent of total farm land.	
Eastern United States	1,226,790	3.9	7.6	107,038	3.2	50.3	40,429,951	8.2	34.4
New England							4,606,345	23.4	351.8
Middle Atlantic	9,515	5.5	139.9				4,536,858	10.5	192.6
North Central	13,324	1.7	150.4				7,132,501	4.8	49.6
Lake	116,925	18.4	40,499.0	6,575	6.8	16,759.0	11,065,761	16.3	67.5
South Atlantic	590,209	3.3	− 28.6	81,075	3.0	88.0	6,127,169	6.0	− 34.9
South Central	496,727	4.2	63.2	19,388	3.3	− 30.9	6,961,317	6.4	3.6
New England:									
Maine							1,160,581	18.4	201.2
New Hampshire							817,884	25.2	601.9
Vermont							1,462,914	31.4	1,478.8
Massachusetts							646,118	22.6	185.0
Rhode Island							79,055	17.9	134.9
Connecticut							439,793	20.1	167.1
Middle Atlantic:									
New York							2,677,594	12.3	208.8
New Jersey							231,865	9.0	84.9
Pennsylvania	9,515	5.5	139.9				1,627,399	8.7	191.6
North Central:									
Ohio							1,592,363	6.6	242.0
Indiana							997,780	4.7	80.8
Illinois							1,326,735	4.1	113.0
Iowa							2,125,374	6.3	− .3
Missouri	13,324	1.7	150.4				1,090,249	3.1	9.4
Lake:									
Michigan	3,641	12.3					3,180,982	16.8	200.6
Wisconsin							3,774,880	18.0	165.4
Minnesota	113,284	18.8	39,234.7	6,575	6.8	16,759.9	4,109,899	14.8	− .4
South Atlantic:									
Delaware							73,296	7.0	14.2
Maryland							234,673	4.7	64.0
Virginia	29,102	3.0	− 81.4				1,209,678	6.2	− 45.0
West Virginia	8,702	1.6	− 15.4	2,454	1.9	87.3	535,849	5.3	142.4
North Carolina	253,257	3.6	− 34.2	8,724	3.2	194.9	1,174,334	5.2	− 41.7
South Carolina	92,624	3.5	− 41.4	17,588	7.8	51.5	1,074,887	8.0	− 48.1
Georgia	146,569	2.6	50.8	45,113	2.4	114.9	1,652,655	6.2	− 35.7
Florida (26 northern counties)	60,045	5.5	212.4	7,196	3.8	14.9	171,797	4.8	33.2
South Central:									
Kentucky	43,037	1.9	28.1				883,030	4.0	34.3
Tennessee	56,987	3.9	125.2				1,143,440	5.7	22.0
Arkansas	118,248	3.6	31.0				828,311	4.7	37.0
Alabama	145,907	6.5	94.9	7,020	2.0	28.8	1,593,967	7.6	− 22.2
Mississippi	81,310	6.1	107.7	12,368	5.1	− 45.3	1,665,665	9.0	11.5
Louisiana	51,238	4.5	24.3				846,904	8.2	− 13.2

Under proper farm management land not suitable for cultivation or pasturage ought to be kept in timber and made to contribute to the farm income. While it is unavoidable that financial stringency or exceptionally high prices will sometimes occasion the sale of woodlots which might otherwise be directly or indirectly a source of permanent income to the farm, it is too often the case that the owners are easily tempted by such offers and do not stop to weigh them against the greater advantage that can perhaps be secured in the long run by leaving the woodlot standing.

Statistics showing the actual number of farms which have woodlots are not available. In the thickly settled regions there are many small farms, and some of fair size, which have no woodlots, but this becomes less and less the case with remoteness from the more densely populated centers. At the same time, the average size of the woodlots, obtained by dividing the total woodlot area by the total number of farms, increases from the least to the most wooded farm regions. This is shown in Table 6, which gives the average woodlot acreage per farm in different States and divisions for 1880 and 1910. The average proportion of farm land wooded is shown for the same years in Table 7.

TABLE 6.—*Average size of woodlots, 1910 and 1880 (assuming a woodlot on each farm).*

State or State group.	Woodland per farm													
	Division I.		Division II.		Division III.		Division IV.		Division V.		Division VI.		Total.	
	1910	1880	1910	1880	1910	1880	1910	1880	1910	1880	1910	1880	1910	1880
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Eastern United States	7.4	13.1	13.7	25.1	27.0	49.2	44.6	80.6	72.9	150.3	161.6	273.3	29.2	66.8
New England	[1] 11.1	1.1	11.1	12.0	34.1	28.0	49.2	42.6	.....	.....	.....	.....	41.6	35.3
Middle Atlantic	5.5	8.2	13.7	16.6	27.0	33.0	46.7	55.7	157.9	118.4	.....	.....	19.8	24.0
North Central	7.8	13.1	14.1	27.4	31.0	46.8	64.3	90.7	91.1	85.9	.....	.....	17.0	27.1
Lake States	8.2	13.8	13.6	25.4	37.4	49.9	52.7	70.2	82.4	71.3	141.3	136.5	22.6	29.6
South Atlantic	7.4	19.0	16.7	28.2	27.2	62.4	44.4	83.9	74.9	159.1	166.7	287.3	43.8	86.5
South Central	4.8	18.6	10.3	37.7	21.6	58.4	41.1	91.6	68.1	139.9	144.9	180.6	32.7	74.9
New England:														
Maine	.....	.....	.....	.....	33.2	25.7	49.8	46.2	.....	.....	.....	.....	46.2	41.7
New Hampshire	.....	.....	.....	.....	.....	.....	55.5	40.3	.....	.....	.....	.....	55.5	40.3
Vermont	.....	.....	15.8	16.3	45.9	38.7	65.6	72.9	.....	.....	.....	.....	47.9	42.3
Massachusetts	[1] 11.1	1.1	18.7	19.5	28.7	24.7	29.4	30.6	.....	.....	.....	.....	28.8	26.1
Rhode Island	.....	.....	6.8	7.1	8.4	7.2	43.7	35.0	.....	.....	.....	.....	35.1	29.4
Connecticut	.....	.....	.....	.....	26.7	20.3	37.1	25.8	.....	.....	.....	.....	28.3	21.1
Middle Atlantic:														
New York	5.1	7.4	15.3	16.3	26.5	27.1	48.9	50.1	.....	.....	.....	.....	20.6	21.6
New Jersey	.....	.7	11.0	13.0	23.0	25.6	23.0	61.2	.....	.....	.....	.....	16.2	20.6
Pennsylvania	5.7	8.9	12.5	17.6	28.1	41.4	50.2	63.4	157.9	118.4	.....	.....	19.5	27.2
North Central:														
Ohio	6.9	17.2	12.1	24.4	25.0	42.9	40.5	55.3	.....	.....	.....	.....	12.1	24.2
Indiana	9.0	23.7	12.8	28.3	27.6	41.3	46.5	64.3	.....	.....	.....	.....	15.6	30.6
Illinois	8.1	11.6	15.9	28.8	29.6	39.9	54.2	75.0	.....	.....	.....	.....	12.5	19.3
Iowa	7.2	9.5	17.8	23.9	34.5	40.3	.....	.....	.....	.....	.....	.....	10.7	14.9
Missouri	9.7	20.5	16.1	32.3	34.5	55.8	66.2	94.4	94.1	85.9	.....	.....	32.2	47.0
Lake States:														
Michigan	8.8	21.7	11.4	26.2	27.1	65.7	43.8	105.5	72.9	.....	.....	.....	14.1	28.9
Wisconsin	9.0	15.4	14.8	23.9	40.1	50.1	51.8	71.6	.....	.....	.....	.....	30.4	35.5
Minnesota	7.7	9.4	22.5	24.2	39.2	41.8	60.0	54.9	82.9	71.3	141.3	136.5	25.1	22.0
South Atlantic:														
Delaware	.....	.....	12.6	12.8	26.0	37.8	.....	.....	.....	.....	.....	.....	23.3	31.9
Maryland	.....	.....	16.8	22.7	27.4	37.1	49.9	73.5	.....	.....	.....	.....	30.0	40.3
Virginia	.....	.....	26.6	36.4	36.4	74.7	49.3	74.8	81.9	153.6	.....	.....	45.7	77.0
West Virginia	7.4	19.0	15.1	35.6	29.7	72.1	56.1	153.7	64.9	158.6	123.7	173.0	41.0	98.6
North Carolina	.....	.....	.....	.....	27.9	61.0	42.1	72.2	69.2	125.3	136.1	286.9	49.1	88.0
South Carolina	.....	.....	.....	.....	22.5	51.9	35.5	77.5	64.2	138.7	179.3	347.3	35.9	77.3
Georgia	.....	.....	.....	.....	24.6	66.7	43.8	97.6	89.8	278.9	181.3	314.3	44.7	110.1
Florida (26 northern counties)	.....	.....	.....	.....	25.0	49.3	50.9	90.0	82.5	101.3	126.7	163.5	61.1	92.2

South Central:														
Kentucky	5.0	19.0	12.1	35.7	25.3	56.4	39.7	92.2	68.3	202.1	.....	.....	26.8	60.7
Tennessee	.....	.....	11.1	42.9	22.0	47.2	44.1	89.4	78.1	158.4	.....	.....	32.6	67.8
Arkansas	.....	.....	6.9	62.9	20.6	74.0	39.3	84.0	70.9	90.9	.....	.....	39.6	83.2
Alabama	.....	.....	9.5	25.7	22.9	57.6	41.5	89.4	63.8	140.5	175.8	141.2	35.9	76.8
Mississippi	.....	.....	7.8	97.7	16.4	71.2	40.9	96.6	64.1	136.3	115.0	199.6	28.7	89.9
Louisiana	3.5	12.4	10.1	31.5	28.3	80.2	41.8	112.8	62.9	121.0	.....	.....	35.8	94.4

[1] Nantucket Island only.

TABLE 7.—*Average proportion of farm land wooded, 1910 and 1880.*

State or State group.	Division I.		Division II.		Division III.		Division IV.		Division V.		Division VI.		Total.	
	1910	1880	1910	1880	1910	1880	1910	1880	1910	1880	1910	1880	1910	1880
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Eastern United States	5.6	11.1	14.0	24.3	30.0	39.7	48.4	57.1	66.9	77.8	84.3	88.6	29.4	38.5
New England	8.6	.5	16.5	15.7	33.5	27.9	45.8	39.7	.....	.....	.....	.....	39.8	34.1
Middle Atlantic	8.4	11.8	15.4	18.5	26.9	31.1	43.1	46.9	79.3	73.5	.....	.....	21.6	25.2
North Central	5.6	10.4	13.5	25.1	27.0	38.1	49.6	63.9	66.2	73.0	.....	.....	14.4	23.0
Lake States	4.9	10.8	13.3	26.2	29.0	39.5	44.0	56.6	66.8	71.5	85.9	82.2	18.1	26.4
South Atlantic	8.8	15.7	15.8	23.0	32.4	42.5	48.7	55.3	67.5	77.9	84.4	89.9	46.9	54.9
South Central	5.9	17.3	16.3	32.8	30.4	46.2	49.9	63.2	65.8	77.9	83.8	76.9	41.2	54.9
New England:														
Maine	.....	.....	.....	.....	35.0	29.5	46.3	43.6	.....	.....	.....	.....	44.1	40.9
New Hampshire	.....	.....	.....	.....	.....	.....	46.2	37.8	.....	.....	.....	.....	46.2	34.8
Vermont	.....	.....	17.3	16.4	32.2	28.9	43.8	43.1	.....	.....	.....	.....	33.6	30.8
Massachusetts	8.6	.5	14.4	19.7	35.3	27.7	43.1	37.7	.....	.....	.....	.....	37.0	29.9
Rhode Island	.....	.....	14.5	12.4	20.7	16.0	45.8	39.0	.....	.....	.....	.....	41.9	35.5
Connecticut	.....	.....	.....	.....	33.1	25.5	43.3	31.1	.....	.....	.....	.....	34.7	26.4
Middle Atlantic:														
New York	7.3	10.5	15.1	16.8	24.6	25.7	43.7	43.8	.....	.....	.....	.....	20.3	21.8
New Jersey	.....	3.6	14.5	15.7	27.3	28.9	41.8	62.6	.....	.....	.....	.....	20.9	24.2
Pennsylvania	9.2	12.8	16.0	21.3	29.4	37.9	42.7	48.2	79.3	73.5	.....	.....	23.1	29.4
North Central:														
Ohio	8.2	18.1	13.6	24.8	25.2	34.8	42.5	44.2	.....	.....	.....	.....	13.6	24.4
Indiana	8.3	22.2	13.4	28.1	26.7	34.8	42.6	54.6	.....	.....	.....	.....	15.8	29.1
Illinois	5.8	9.0	13.6	24.5	25.9	38.0	40.0	57.7	.....	.....	.....	.....	9.7	15.6
Iowa	4.5	7.0	12.8	18.4	22.6	30.7	.....	.....	.....	.....	.....	.....	6.8	11.1
Missouri	7.0	16.2	13.6	25.9	28.7	43.2	50.2	65.4	66.2	73.0	.....	.....	25.8	36.4
Lake States:														
Michigan	4.6	22.8	12.8	30.1	27.6	63.4	43.2	81.1	68.6	.....	.....	.....	15.5	32.2
Wisconsin	8.0	13.9	14.3	23.7	30.6	39.3	44.1	58.9	.....	.....	.....	.....	25.5	31.1
Minnesota	3.7	6.2	13.6	16.8	27.0	30.7	43.8	42.8	66.7	71.5	85.9	82.2	14.2	15.2

TABLE 7.—*Average proportion of farm land wooded, 1910 and 1880*—Continued.

State or State group.	Division I.		Division II.		Division III.		Division IV.		Division V.		Division VI.		Total.	
	1910	1880	1910	1880	1910	1880	1910	1880	1910	1880	1910	1880	1910	1880
South Atlantic:	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Delaware			11.9	10.4	27.9	30.2							24.3	25.6
Maryland			16.2	19.4	27.8	30.9	44.1	47.2					29.0	31.9
Virginia			17.4	20.7	33.3	44.1	48.7	46.5	64.1	63.1			43.2	46.0
West Virginia	8.8	15.7	15.6	30.6	30.6	53.8	49.1	70.7	69.5	84.9	84.5	89.1	39.6	60.6
North Carolina					36.5	48.9	50.7	55.3	67.4	74.7	84.6	93.2	55.5	62.0
South Carolina					34.0	39.2	46.6	56.1	66.1	75.5	81.9	85.9	46.9	53.9
Georgia					32.6	42.1	47.9	57.9	68.3	85.9	84.6	90.0	48.2	58.6
Florida (26 northern counties)					32.2	37.4	47.8	61.2	70.0	73.9	85.2	88.4	55.8	63.4
South Central:														
Kentucky	6.1	17.8	16.2	31.5	28.4	45.9	47.1	63.2	68.3	85.9			31.3	47.0
Tennessee			15.7	51.1	30.0	43.7	48.8	62.9	66.5	78.9			40.0	54.4
Arkansas			18.3	53.6	33.0	61.5	48.2	65.3	64.6	68.7			48.9	65.2
Alabama			17.0	27.1	32.5	42.5	50.6	63.0	63.4	77.5	85.5	78.1	45.6	55.3
Mississippi			18.2	46.6	30.4	49.2	49.2	63.0	66.8	75.8	81.4	76.6	42.5	57.7
Louisiana	4.5	10.2	12.8	23.9	30.9	48.0	49.8	60.6	66.4	76.5			41.3	55.1

INCREASE IN VALUE OF WOODLOT PRODUCTS.

The value of woodlot products cut each year in the Eastern States has increased rapidly. Between 1880 and 1910 the increase was over 90 per cent. It was due partly to the rapid rate of clearing and partly to the increase in the intrinsic value of the products. The rate of increase varies with the region. In thinly settled regions it is rapid; in thickly settled regions, slow. This is shown for the Eastern States as a whole and in geographic groups in Table 8, which also gives the total amount of income from woodlot products in 1909 according to the Thirteenth Census, the percentage of farms which reported woodlot incomes, and the proportion of income represented by wood sold and wood used on the farm. As a rule, less than half the total number of farms reported woodlot products. This does not mean that less than half had woodlots, since there were undoubtedly many farms with woodlots which cut no timber in that year.

TABLE 8.—*Total value of woodlot products, 1909, with increase in value since 1899 and 1879.*

[Compiled from Thirteenth Census, Vol. V, Table 154.]

State groups.	Proportion of farms reporting woodlot products.	Value of woodlot products.			Increase in value since—	
		Total.	Proportion used on farms.	Proportion sold.	1899 (10 years).	1879 (30 years).
	Per cent.		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Eastern United States	43.2	$169,948,468	52.7	47.3	70.5	90.9
New England	61.5	17,664,763	35.4	64.6	68.7	78.8
Middle Atlantic	43.2	19,110,765	48.0	52.0	30.7	21.7
North Central	31.8	26,746,377	61.8	38.2	26.6	11.9
Lake States	50.8	22,652,837	57.6	42.4	39.4	95.8
South Atlantic	50.3	44,010,178	51.0	49.0	137.3	213.1
South Central	42.0	39,763,548	55.5	44.5	113.4	185.6

The last two columns of Table 8 show that the greater part of the increase in the 30 years from 1879 to 1909 came in the last 10 years. This is especially striking in the case of the Middle Atlantic and North Central States, where the value of woodlot products was actually greater in 1879 than in 1899. This is perhaps attributable chiefly to the greater aggregate quantity of timber cut in these States in the former year, when clearing was active. The great rise in the last 10 years was due primarily to the general rise in value of wood products, though partly also to the large quantities of wood available from clearing.

AMOUNT AND QUALITY OF WOODLOT TIMBER.

Though the area in woodlots is quite closely known, the total stand of woodlot timber can only be estimated. Such an estimate

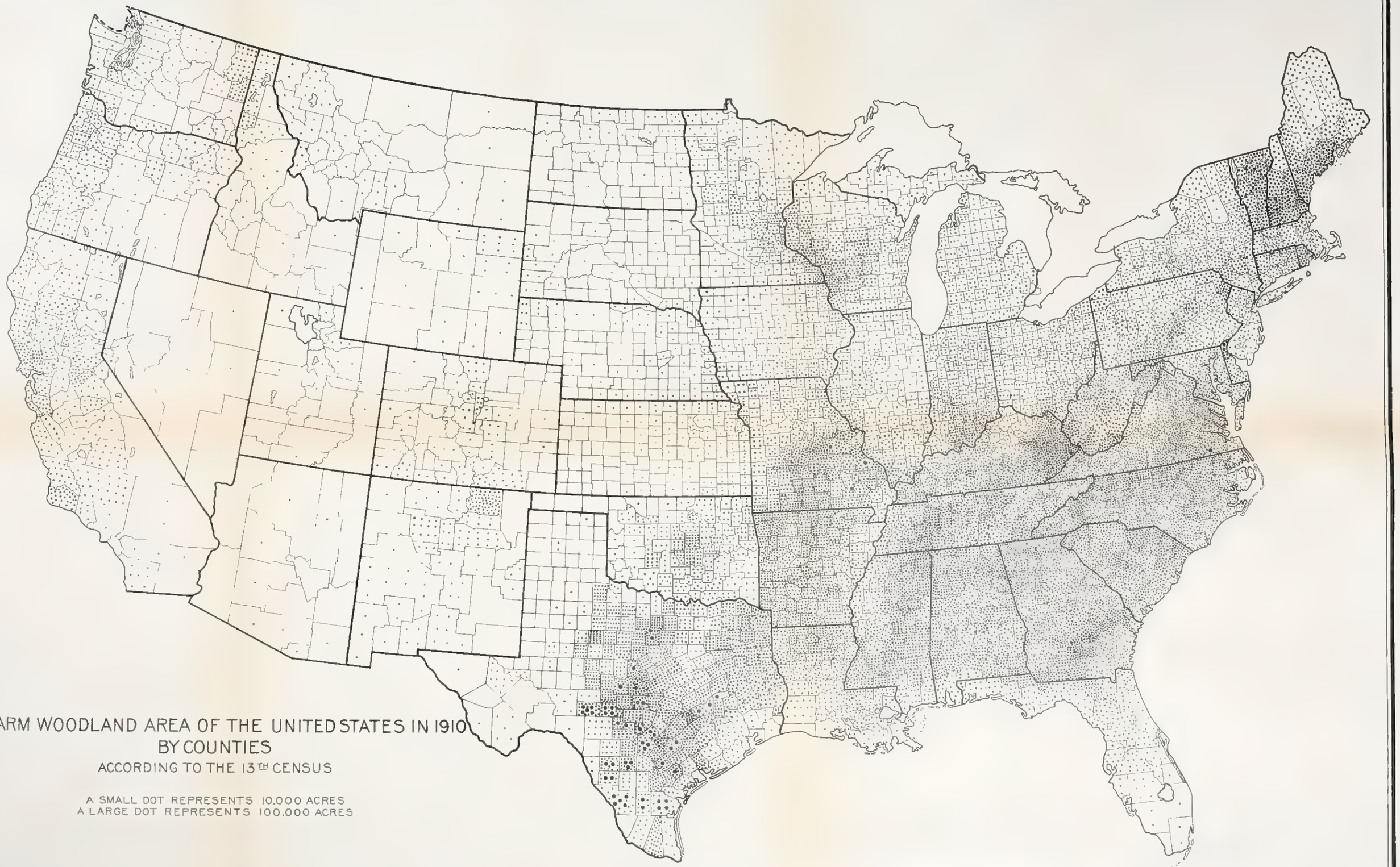
was made in 1909.[1] In the States considered in this bulletin, about 40 per cent of the total woodlot area, or 58,000,000 acres, were estimated to contain merchantable timber suitable for lumber, veneer, etc.; about 45 per cent, or 65,200,000 acres, had cordwood; and about 15 per cent, or 21,800,000 acres, were brush land of only potential value. Assuming that the average stand of merchantable timber is 3,000 board feet per acre, with 10 standard cords of wood in addition, and that the average stand in the woodlots fit for cordwood only is 8 cords per acre, the total stand would be 174,000,000,000 board feet of log timber and about 1,100,000,000 cords of other wood. According to this estimate, the stand of log timber alone equals 15.6 per cent, or nearly one-sixth of all standing timber in the Eastern States.[2]

A large proportion of the woodlots have been culled of their best timber, and many have been so badly depleted by overcutting, grazing, and fire that there is very little material left in them of more than firewood value. Ignoring the fact that many of the large commercial forests have suffered in the same way, it is often argued that woodlot timber is essentially inferior to that of the timber forests and that it is suited for only a few kinds of rough products—rough lumber for farm buildings, cordwood for fuel, posts for the farm fences, a few ties and poles for sale to railroad, telegraph, and telephone companies, etc. This argument may be justified, so far as lumber is concerned, by the fact that farm lumber when cut and sold by the owner or a local sawyer is apt to be poorly manufactured, poorly graded, and poorly seasoned; but it is not true that the producing value of woodlots is restricted to the rough products above mentioned. A very large part of the high-grade hickory, ash, and white oak, now becoming scarce because of their extensive use in the vehicle, handle, cooperage, and other industries, comes from woodlots. Many woodlots contain timber every bit as good as that in the larger tracts and fully as capable of yielding high-grade lumber if properly sawed and seasoned. Throughout the Eastern States woodlots contain large quantities of pulpwood suitable for paper making, low-grade lumber for boxes, bolts for slack and tight barrel cooperage, and excellent log and bolt material of many species for veneer. There is hardly a use to which wood is put that can not be contributed to, liberally, from the woodlot supply. That fuel is a proportionately large part of the woodlot output does not imply that woodlots run more largely to low-grade material than the larger

[1] "Standing Timber in Woodlots," by Wesley Bradfield, in Report of the National Conservation Commission, 1909, Vol. II, pp. 181–187.

[2] The total stand in the States covered by this bulletin is estimated as 1,117,700,000,000 board feet by H. S. Betts and W. B. Greeley ("Structural Timber in the United States," Sept., 1915). This estimate is based largely on reports of the Bureau of Corporations and of the National Conservation Commission.

Dept. Bul
Status and Value of Farm Woodlots in the Eastern U S
Bulletin 481 U S Department of Agriculture



FARM WOODLAND AREA OF THE UNITED STATES IN 1910
BY COUNTIES
ACCORDING TO THE 13TH CENSUS

A SMALL DOT REPRESENTS 10,000 ACRES
A LARGE DOT REPRESENTS 100,000 ACRES

forests. On the contrary, it may signify a closer utilization of branches and small or inferior trees.

WHAT THE WOODLOT PROMISES FOR THE FUTURE.

Since anything which benefits the farms contributes to the general prosperity, the woodlots must be considered a national asset from both the direct and the indirect standpoints. It is of manifest advantage to have maintained throughout the country small bodies of timber not only to supply the local demands for wood, which will increase as the existing large bodies of timber decrease in amount, but also as a possible factor in preserving good climatic conditions, in checking the sweep of winds, preventing the undue washing of soil, and in contributing an object of variety and beauty to a land surface a large part of which would otherwise be bare and monotonous. As a supply of wood products for local consumption woodlots have lessened the drain on the general markets fed by the large-scale lumbering operations and have contributed much of the raw material used for veneer, vehicle, cooperage, and handle making, paper, pulp, and excelsior manufacture, wood for fuel, and other important uses.

The future of the woodlot can be predicted with some degree of assurance. It hinges principally upon the attitude which the farmers will take. Except in New England and a few smaller regions in which raising timber in woodlots is already an important source of farm income, most farmers are still prone to regard their woods as a transitory asset to be realized once only when the land is finally cleared. As agricultural development proceeds, the decrease in the aggregate area of farm woodland is bound to continue; but a reduction in the rate of decrease can be expected as the farmers come to realize more fully the advantages of owning thrifty woodlands. The inaccurate and misleading conception of the woodlot as only a temporary asset will yield to an increasing appreciation of it as a growing crop, like any other farm crop. Eventually, a relatively stable condition of woodlot area will probably be reached, which may vary locally according to local demand and supply, but for the country as a whole will tend to remain fairly constant. Farms in hilly or mountainous regions, having larger proportions of untillable lands, will also have larger woodlots than those in level country; but even the latter may be expected, considering their nearness to manufacturing centers, to have moderate amounts of woodland of high producing value.

With proper treatment, it is not unlikely that the woodlots now existing could be made to yield perpetually an average of half a

standard cord[1] of wood per acre per year. At this rate an aggregate annual yield of 71,500,000 cords could be expected in perpetuity from the present total woodlot area of 143,000,000 acres. To equal the total income from farm wood as reported by the census of 1910, the value per cord would have to be only $2.38.

If it is assumed that the permanent woodlot area of the future will amount to an average of 10 acres per farm[2] or a total for the Eastern States of 49,030,850 acres (based on the number of farms in 1910), the sustained annual yield supported by a growth of one-half cord per acre per year would aggregate 24,515,425 cords. In order to equal the income from woodlots in 1910 the value per cord would have to be $6.93, nearly three times as great as that previously assumed; but it is not improbable that future stumpage values will rise to this or even to higher levels.

As the population increases farming tends to become more intensive and the application of scientific principles to farming more essential. These principles involve, above all, the careful study of the productivity of the various kinds of soil on the farm and the choice for each kind of soil of the kind of crop best adapted to it. This means that wood, considered as a farm crop, will be raised only on soils which can not be made to yield a greater revenue from some other crop. In the pioneering stage of agriculture wood has had, and in many sections still has, a very low value compared with other crops which might be raised on much of the same land. In the more thickly settled regions, however, its relative value has increased in the past, and as the population becomes dense and the present large timber supplies fail this value may be expected to increase still more in relation to other crops. In other words, the quality of soil on which it will be profitable to keep woodlots for productive purposes alone may, in the light of future intensification of agriculture, be higher than one would be likely, at first glance, to suppose. This presupposes, of course, as high scientific thought and attention to the woodlot in the selection of species, stimulation of growth, and other silvicultural treatment as would be given any of the other farm crops by a farmer bent on getting the most out of every square rod of his land.

As an immediate measure too much emphasis can not be placed on the importance to farm and community alike of retarding to a rea-

[1] A standard cord is a pile of wood in 4-foot lengths, measuring 8 by 4 by 4 feet, and containing 128 cubic feet. The cord unit is used here to represent growth not only in fuel wood, but also in logs, poles, and other high-grade forms customarily measured in board feet or other units. This should be borne in mind with reference to the prices per cord which follow; these would of course be excessive for ordinary cordwood. In medium-sized or small timber 1,000 board feet, Scribner, are usually considered equivalent to from 2 to 5 cords of cordwood.

[2] The present average is 29.2 acres. (See Table 6.)

sonable extent the process of shrinkage in farm woodlands. Overmature and decaying woods, it is true, must often be cut at once to secure any return from them, and financial stringency may force the sacrifice of young, thrifty stands without suitable provision for securing a new growth at least equally good. Clearing under these conditions is inevitable. But there is a pronounced tendency, especially upon transfers of title to farm property, to clear land recklessly for whatever small value is offered. This is shown by the great increase in unimproved lands without woods, which, according to Table 5, amounted to 34 per cent in the 30 years between 1880 and 1910. By cooperation in control of farm property this situation might in large measure be rectified.

WOODLOTS AND COMMUNITY FORESTS.

The highest direct value of woodlots is to the local communities. Census statistics for 1909 show that the farms themselves consumed over half the value of the woodlot products. Of the material sold much undoubtedly went to near-by farms, or to local dealers in lumber and fuel, to be retailed for consumption in the neighborhood. A great many small veneer, vehicle, cooperage, and other factories derive their entire supply from local woodlots.

There is thus every incentive for communities to encourage the development of local woodlots and thereby protect themselves from future timber scarcity and high prices. Several States have already taken steps in this direction by passing laws providing for a final yield tax on timber when cut instead of the annual taxation still customary in many States. Such legislation, together with the gradually increasing value of timber, appeals to the individual farmers and will doubtless encourage many of them to practice woodlot forestry. But in order to insure a perpetual annual yield of timber in desirable forms and in substantially equal quantities other steps are necessary. Timber is a "long-time" crop. To secure annual yields of any size a comparatively large aggregate area, managed under a single working plan, is essential, though the timber may be divided among many small, isolated tracts. The individual farmer can not, therefore, practice forestry as a business except in a small way. It is possible that individuals may occasionally be induced to pool their woodlot properties under a single system of operation. This may work out in connection with the development of the present cooperative movement among farmers. It is probable, however, that in the future a separate class of forest holdings, community or town forests, intermediate in character between the farm woodlot and the larger, more remote bodies of timber, will afford permanent annual supplies of wood products to local communities.

Europe affords many illustrations of successful communal forests.[1] In France, for example, over 11,000 communities have forests, with an aggregate area of 5,000,000 acres—nearly a quarter of the total forest area of the country. In Austria over 3,000,000 acres, in Germany 5,600,000 acres, and in Switzerland nearly 1,350,000 acres belong to communities. Italian communal forests form over 43 per cent of the total forest area. The amount of woodland owned by a single community varies from 2½ to over 15,000 acres. In Prussia the size averages about 2,000 acres, but this is probably the highest for all Germany.

The income from European communal forests is very large considering the poor quality of soil on which the timber thrives. The better managed of them yield annually a net income of from $7 to over $10 per acre. The average gross revenue from 2,000 acres would be about $6,500, and it is not surprising to find communities that derive from these forests a revenue sufficient not only to pay all the taxes corresponding to our county, town, and school taxes, but to yield, in addition, an annual dividend to every householder. From the 2,500 acres of timber owned by the Swiss city of Zurich, for example, the net income has averaged as much as $20,000 per year for a period of 10 years; and Freiberg, in Germany, derives from $20,000 to $30,000 annually from its 3,000-acre woodlot. It is estimated that the 5,600,000 acres of communal forest in Germany yield annually a net income of $9,250,000, which, capitalized at even 3 per cent, represents a property worth $308,000,000.

Though the returns mentioned above are undoubtedly far in excess of any which could be obtained in this country for years to come, they at least indicate a great possibility for the future development of the American woodlot. There are always soils available which are too poor, swampy, or steep for cultivation, orchard, or even pasture, and it is on these that tree growth can be practiced with success. Already there are more than 60 American cities and towns, situated in 10 or 15 States, which have acquired municipal forests ranging in area from 50 to 25,000 acres.[2] While the primary object of these holdings is ordinarily to protect water supplies from contamination, many of them are already being carefully managed, and it is only a question of time when many will yield a direct income over and above their value for protection.

WOODLOTS AND PUBLIC FORESTS.

The largest share of the timber for consumption in the future must unquestionably be grown on areas set aside as National and State

[1] The figures which follow are taken from "Communal Forests," by Raphael Zon, in Bailey's "Cyclopedia of American Agriculture," Vol. IV, pp. 144–148; 1909.

[2] See "County, City, Town, and School Forests," by Prof. J. W. Toumey, in American Forestry, July, 1916, pp. 428–429.

forests, or areas managed by stable and long-lived corporations. Such forests can be located only in nonagricultural regions, or at least in regions in which soil for practicable cultivation is confined to small and widely separated areas. Usually these forests will combine the functions of timber raising with those of watershed protection, recreation, and other purposes. Incidentally, they may serve, like the woodlots, as means of ameliorating the climate of regions lying to the leeward.

In farming regions adjacent to public forest areas, the large supply of available timber will make farm woodlots of relatively minor importance compared with those farther from the large forests and closer to manufacturing centers. In such situations, the woodlot will more than ever be relegated to the poor farm lands which can not be used to advantage for other purposes; but as compared with existing woodlots in mountainous regions, the value under future conditions of demand and supply will probably be a sufficient incentive to the care and practical management of even the mountain woodlot as a valuable farm crop.

The solution of the problem of timber production in the East will undoubtedly be a combination of all the classes of ownership above outlined. Each one has its distinct place, and the private or communal woodlots as a source of many kinds of timber for many uses will serve to fill varied local demands and thereby reduce the drain on the larger bodies of forest.

THE WOODLOT AS A FARM RESOURCE.

The value of woodlots to farms includes not only the direct income value from the wood products which are or might be produced, but also a variety of indirect benefits, such as the protection of stock, crops, and buildings from sun and wind, prevention of soil erosion, renewal of worn-out soils, improvement to the appearance of the farm, etc. Thus a woodlot may at the same time increase the general prosperity of the farm, add to its comfort as a home, and enhance its value as an investment. In some parts of the country the indirect uses, though not measurable in dollars and cents, are even more valuable than the direct wood-producing function of the woodlot; but, since they are more or less intangible, farmers are likely to neglect them in deciding whether to preserve or clear away their woodlots.

The farmer has a permanent interest in his property, and it is to his advantage to increase its value both as a present home and as an inheritance for his children. In both respects a farm with a well-tended and well-proportioned woodlot is worth more than one without, over and above the stumpage value of the trees themselves. It

has been estimated that in parts of Minnesota woodlots as small as 5 acres will increase farm values by $500, and this is probably a conservative estimate for the country as a whole.

As a producing crop the woodlot is valuable mainly as a "poor-land crop," yielding a higher income than other crops from soil too steep, stony, swampy, or "worn out" for successful cultivation. In pioneering regions much good, tillable soil besides must often remain for years uncultivated, owing to lack of means to improve it. It is a mistake to clear such land in advance of the farmer's ability to put it into crops, unless very good prices are offered for the timber. Even when profitable sales are made, part of the woodlot can be left and improved by the taking out of only a designated portion of the trees. When high prices for wood become general, little additional incentive will be needed to preserve and improve the woodlots.

In thinly settled regions and in some of the States as a whole woodlot products yield a very considerable part of the total farm income. In New Hampshire and Vermont, for example, woodlot products are the second most important farm crop; in Maine, South Carolina, Georgia, Alabama, Mississippi, and Arkansas, they are the third. Where farming is in a pioneering stage, the sale of wood is very often the determining factor which enables the farmer to tide over the first years during which he has not enough land in cultivation to support him. How the woodlot income compared in 1909 with the total farm income in different regions in each State is shown in Table 9. The relative importance of woodlot products as a source of income is well brought out in the case of Minnesota, for example, where it was progressively greater from Division I, with 1 per cent of the total farm income, to Division VI, where it formed nearly 45 per cent.

TABLE 9.—*Woodlot income in per cent of total income, 1910.*

[Based on averages of census returns from 450 counties chosen at random from the woodlot divisions in each State.]

State or State group.	Proportion of total farm income, 1910.						
	Division I.	Division II.	Division III.	Division IV.	Division V.	Division VI.	Total.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Eastern United States	1.3	3.2	5.6	9.1	11.0	19.1	5.2
New England	.....	1.5	10.8	14.4	.....	.....	12.5
Middle Atlantic	1.6	3.6	7.4	12.4	20.5	.....	4.6
North Central	1.0	2.8	5.0	6.5	7.3	.....	2.5
Lake States	1.7	3.7	6.6	17.2	35.0	44.8	5.2
South Atlantic	.....	3.9	4.6	7.3	9.3	18.4	6.4
South Central	1.8	2.3	3.9	6.7	11.7	.....	5.3
New England:							
Maine	.....	.....	13.6	13.0	.....	.....	13.1
New Hampshire	.....	.....	.....	22.1	.....	.....	22.1
Vermont	.....	.....	11.6	16.1	.....	.....	12.9
Massachusetts	.....	.....	10.7	8.3	.....	.....	10.1
Rhode Island	.....	1.5	1.7	13.9	.....	.....	7.8
Connecticut	.....	.....	8.9	13.5	.....	.....	9.7

TABLE 9.—*Woodlot income in per cent of total income, 1910*—Continued.

State or State group.	Proportion of total farm income, 1910.						
	Division I.	Division II.	Division III.	Division IV.	Division V.	Division VI.	Total.
Middle Atlantic:	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
New York	1.1	4.1	8.8	15.2	.....	.....	5.4
New Jersey	.....	2.0	1.8	2.6	.....	.....	1.9
Pennsylvania	1.8	3.4	7.3	13.5	20.5	.....	4.3
North Central;							
Ohio	1.6	3.5	5.2	3.5	.....	.....	3.1
Indiana	1.0	3.5	5.5	6.7	.....	.....	3.1
Illinois	.7	1.8	2.9	.....	.....	.....	1.2
Iowa	1.0	2.4	4.5	.....	.....	.....	2.0
Missouri	1.0	3.3	6.2	11.6	7.3	.....	3.7
Lake States:							
Michigan	4.1	4.7	11.2	20.2	28.4	.....	6.4
Wisconsin	2.1	3.6	7.3	22.1	.....	.....	6.0
Minnesota	1.0	3.0	4.6	9.8	35.8	44.8	3.9
South Atlantic:							
Delaware	.....	1.8	6.8	.....	.....	.....	3.8
Maryland	.....	5.0	4.9	12.2	.....	.....	6.5
Virginia	.....	.....	6.8	11.4	9.0	.....	8.6
West Virginia	.....	7.2	7.1	13.4	27.1	.....	10.4
North Carolina	.....	.....	5.8	7.9	10.4	.....	8.4
South Carolina	.....	.....	2.2	3.0	5.2	16.6	3.3
Georgia	.....	.....	3.9	5.8	14.0	21.2	6.2
Florida (northern part)	.....	.....	6.8	8.4	20.4	15.5	11.6
South Central:							
Kentucky	1.9	2.1	8.2	11.0	23.3	.....	7.0
Tennessee	.....	.....	4.1	9.4	11.3	.....	6.2
Arkansas	.....	.....	4.8	5.6	10.6	.....	6.2
Alabama	.....	2.3	3.1	5.5	7.9	.....	4.4
Mississippi	.....	.....	2.1	6.5	8.6	.....	4.8
Louisiana	1.5	.5	2.4	4.5	11.8	.....	3.4

The value to the individual farm of the woodlot products reported to the 1910 census averaged $81. In order to ascertain the approximate values per farm of the amounts which were either sold or consumed on the farm in the different woodlot divisions, 450 counties were chosen at random from the different divisions in each State. The total values for each county were divided by the number of farms reporting. On the average, less than half of all the farms reported, so that the average income, based on all the farms in the counties, would have been smaller. The average total value per farm reporting ranged, as a rule, from about $30 to over $400, smallest in the counties in woodlot Division I and largest in those in Division VI. The average values of the amounts used on the farms were exceedingly constant throughout the woodlot divisions. The values of the amounts sold, on the other hand, were naturally much the greatest in the thinly settled divisions. Table 10 gives the value per farm of the products used and sold in the selected counties, according to division and State.

TABLE 10.—*Average value per farm of woodlot products used on farm and those sold, in 1910.*

[Based on averages of census returns from 450 counties at random from each woodlot division in each State.]

State or State group.	Value per farm reporting.											
	Division I.			Division II.			Division III.			Division IV.		
	Total.	Used on farm.	Sold.	Total.	Used on farm.	Sold.	Total.	Used on farm.	Sold.	Total.	Used on farm.	Sold.
Eastern United States	$69	$47	$22	$74	$47	$27	$80	$42	$38	$93	$42	$51
New England	.....	.....	.....	76	40	36	130	52	78	162	58	104
Middle Atlantic	69	39	30	84	48	36	110	46	64	106	40	66
North Central	73	49	24	69	43	26	70	39	31	71	38	33
Lake	61	46	15	71	50	21	73	46	27	138	48	90
South Atlantic	.....	.....	.....	112	66	46	65	39	26	81	39	42
South Central	75	62	13	54	45	9	66	39	27	64	36	28
New England:												
Maine	.....	.....	.....	.....	.....	.....	119	47	72	141	56	85
New Hampshire	.....	.....	.....	.....	.....	.....	.....	.....	.....	218	68	150
Vermont	.....	.....	.....	.....	.....	.....	149	66	83	197	82	115
Massachusetts	.....	.....	.....	.....	.....	.....	146	49	97	164	39	125
Rhode Island	.....	.....	.....	76	40	36	128	51	77	136	32	104
Connecticut	.....	.....	.....	.....	.....	.....	107	46	61	177	49	128
Middle Atlantic:												
New York	57	46	11	87	55	32	114	56	58	104	47	57
New Jersey	.....	.....	.....	62	32	30	102	39	63	53	32	21
Pennsylvania	73	37	36	86	37	49	106	35	71	122	28	94
North Central:												
Ohio	75	52	23	68	36	32	72	31	41	71	32	39
Indiana	79	40	39	85	47	38	66	27	39	55	32	23
Illinois	68	44	24	61	39	22	66	35	31	.....	.....	.....
Iowa	75	55	20	63	50	13	78	59	19	.....	.....	.....
Missouri	66	50	16	68	49	19	70	47	23	90	50	40
Lake:												
Michigan	76	52	24	87	49	38	108	42	66	186	55	131
Wisconsin	60	47	13	67	54	13	81	54	27	156	47	109
Minnesota	52	40	12	63	45	18	53	36	17	92	49	43
South Atlantic:												
Delaware	.....	.....	.....	56	42	14	67	28	39	.....	.....	.....
Maryland	.....	.....	.....	150	93	57	81	46	35	136	50	86
Virginia	.....	.....	.....	.....	.....	.....	75	27	48	89	29	60
West Virginia	.....	.....	.....	160	62	98	72	30	42	105	41	64
North Carolina	.....	.....	.....	.....	.....	.....	46	38	8	65	34	31
South Carolina	.....	.....	.....	.....	.....	.....	49	40	9	51	30	21
Georgia	.....	.....	.....	.....	.....	.....	62	56	6	82	62	20
Florida (26 northern counties)	.....	.....	.....	.....	.....	.....	118	60	58	188	87	101
South Central:												
Kentucky	98	79	19	85	66	19	104	51	53	75	34	41
Tennessee	.....	.....	.....	.....	.....	.....	48	30	18	55	31	24
Arkansas	.....	.....	.....	.....	.....	.....	73	51	22	57	32	25
Alabama	.....	.....	.....	32	30	2	58	37	21	59	36	23
Mississippi	.....	.....	.....	.....	.....	.....	34	27	7	62	44	18
Louisiana	30	29	1	47	41	6	109	54	55	102	47	55

TABLE 10.—*Average value per farm of woodlot products used on farm and those sold, in 1910*—Continued.

[Based on averages of census returns from 450 counties at random from each woodlot division in each State.]

Division or State.	Value per farm reporting.								
	Division V.			Division VI.			Total.		
	Total.	Used on farm.	Sold.	Total.	Used on farm.	Sold.	Total.	Used on farm.	Sold.
Eastern United States	$94	$39	$54	$232	$51	$181	$85	$43	$42
New England							147	55	92
Middle Atlantic	122	44	78				95	45	50
North Central	37	30	7				69	42	27
Lake	187	51	136	325	61	264	83	47	36
South Atlantic	91	43	48	228	50	178	80	41	39
South Central	95	36	59				70	38	32
New England:									
Maine							136	54	82
New Hampshire							218	68	150
Vermont							164	71	93
Massachusetts							149	47	102
Rhode Island							129	33	96
Connecticut							118	46	72
Middle Atlantic:									
New York							97	54	43
New Jersey							70	34	36
Pennsylvania	122	44	78				95	35	60
North Central:									
Ohio							71	38	33
Indiana							73	36	37
Illinois							64	40	24
Iowa							71	54	17
Missouri	37	30	7				66	46	20
Lake:									
Michigan	192	30	162				99	48	51
Wisconsin							87	52	35
Minnesota	187	53	134	325	61	264	72	42	30
South Atlantic:									
Delaware							64	33	31
Maryland							109	55	54
Virginia	100	41	59				83	29	54
West Virginia	380	93	287				101	39	62
North Carolina	84	34	50				69	35	34
South Carolina	80	46	34	455	81	374	62	38	24
Georgia	62	34	28	207	52	155	75	52	23
Florida (26 northern counties)	266	149	117	172	33	139	193	92	101
South Central:									
Kentucky	173	32	141				101	44	57
Tennessee	64	25	39				53	30	23
Arkansas	68	31	37				64	36	28
Alabama	72	40	32				57	36	21
Mississippi	84	40	44				58	38	20
Louisiana	133	56	77				104	50	54

Compared with other crops, woodlots need very little attention. The growth is laid on year after year without cultivation, and the occasional thinnings which are necessary to increase the growth of the better trees can be made to pay for themselves in cash or in wood for farm consumption. If mature trees are to be removed for sale, the work can be done at any time when other farm work is not pressing. An important feature is that farm labor and teams can thus be utilized during periods when otherwise they might be idle. In effect this increases the income to be expected from the woodlot and thus raises the value of the standing timber.

The attitude of farmers toward their woodlots probably differs a great deal in different regions. Those functions of the woodlot which are of most value at a given time and place are emphasized, and other valuable functions perhaps not recognized at all. Where agriculture is entering heavily wooded regions in which cleared land is at a premium and wood is cheap, timber is likely to be considered only an incumbrance, or at best as a means of eking out a livelihood until the cleared and cultivated land becomes sufficiently productive. In long-settled farming regions, where woodlots have been overcut, overgrazed, or repeatedly burned until only a few defective trees are left, the farmer may prefer to save the remnant simply for the shade it gives to stock or buildings, or for some sentimental reason. In prairie country, protection to grain crops, orchards, stock, or buildings, together with service as a convenient supply of wood for farm consumption may cause owners to place a high value on their woodlots. In mountainous regions near thickly populated manufacturing centers, as in New England, the woodlot may be valued for its wood-producing capacity alone. The temptation is to underestimate those functions of the woodlot which are not obviously beneficial under the conditions existing in the immediate locality. These less obvious functions are often the very ones which are likely to prove of the greatest value in the long run. For example, many of the Minnesota farmers who totally cleared their lands would be glad to have their woodlots back again if only for protective purposes, and farmers in the Central States already regret the abuse which has spoiled their woodlots as productive agents of increasing value on the poorer soils of the farm.

It is therefore greatly to the interest of all woodlot owners to consider thoroughly not only the present but the possible future usefulness of their timber from every point of view. Circumstances, such as the need of ready cash in "hard times," may, of course, make it necessary or advisable to sacrifice the woodlot, even though the loss to the farm is greater than the immediate cash income from the wood products. Clearing of excess woodlands is necessary when the soil can be put to a more paying use, for cultivation, pasture, or orchard. The point is that before cutting off his wood the farmer should carefully weigh its value, in all its phases, against the income which he can hope to make from the contemplated use of the soil. He should not clear, if he can help it, unless the balance stands unmistakably against the timber.

HOME SUPPLY.

Most farms use yearly a great deal of wood, which must be bought if it is not taken from the woodlot. Firewood, lumber, fencing, and poles are the forms in which the woodlot material is most used, but

there are many other products for special uses and emergencies which the woodlot supplies. Substitutes for wood are, of course, coming more and more into use. Rail fences have long been displaced in general use by wire fencing, and steel and cement fence posts are growing in favor in many regions. Coal is used for fuel, and concrete for construction. In general, however, the woodlot products have the advantage of cheapness and ready availability. The woodlot thus has a "convenience value" apart from its intrinsic value.

Firewood.—The largest "home use" of the woodlot is for firewood. In a study by the Office of Farm Management,[1] U. S. Department of Agriculture, of the ways in which the farm contributes to the farmer's living, the average amounts and values of wood and coal used on farms for fuel were determined for various States. The averages were based on satisfactory records obtained from 483 families visited, distributed fairly evenly through 10 areas in as many States, representative of the kind of agriculture practiced in the regions. For those of the 10 States covered which fall within the scope of the present bulletin the average amounts and values were as shown in Table 11.

TABLE 11.—*Average annual consumption of coal and wood on farms in eight States, with the proportion of wood bought and the proportion furnished by the farm.*[1]

[The amount of wood is expressed in the standard cord; that is, the amount contained in a pile 8 feet long by 4 feet high and 4 feet wide. This is equivalent to 3 cords of "stove-wood" (16-inch lengths).]

State and county.	Coal.		Wood.					
	Per family.		Per family.		Per person.		Bought.	Furnished by farm.
	Tons.	Value.	Cords.	Value.	Cords.	Value.	Per cent.	Per cent.
Vermont (Lamoille)	0.1	$1.01	14.3	$65.40	3.0	$13.62	3.0	97.0
New York (Otsego)	2.5	16.00	12.3	54.80	3.1	13.70	1.8	98.2
Pennsylvania (Bucks)	4.9	26.90	6.2	19.00	1.2	3.65	5.8	94.2
Ohio (Champaign)	5.7	23.70	12.0	32.50	2.9	7.93	6.2	93.8
Wisconsin (Jefferson)	3.0	20.70	7.5	38.80	1.1	5.34	7.7	92.3
Iowa (Montgomery)	3.9	29.57	4.8	22.40	1.7	8.82	.....	100
North Carolina (Gaston)	.....	.....	14.0	43.58	3.1	9.68	3.9	96.1
Georgia (Troup)	.....	.....	17.8	51.60	3.3	9.56	.....	100
Average	2.5	14.74	11.1	41.01	2.4	9.04	3.55	96.45

[1] From Farmers' Bulletin 635, "What the Farm Contributes Directly to the Farmer's Living," by W. C. Funk. See also Department of Agriculture Bulletin 410, "Value to Farm Families of Food, Fuel, and Use of House," by W. C. Funk.

Though the number of farms which supplied the data was not large, the fact that they were taken at random lends value to the table as an indication of the usefulness of the woodlot for fuel not only in these States but in the other Eastern States also. A great many farmers use coal for fuel, but there are probably very few

[1] Department of Agriculture, Farmers' Bulletin 635, "What the Farm Contributes Directly to the Farmer's Living," by W. C. Funk.

who depend entirely upon it. In only two States—Pennsylvania and Iowa—did the amount spent for coal exceed that spent for wood. In Pennsylvania this was probably due to the ready availability and cheapness of coal; in Iowa, to the relative scarcity of wood. The proportion of wood furnished by the farms on which it was consumed is significant. This averaged over 96 per cent, and the remainder—less than 4 per cent—was probably bought from adjacent farms. In the two Southern States that appear in the table, approximately three-fifths of all the wood was used in fireplaces. The other two-fifths was used in cookstoves.

The heating value of coal is, of course, much greater than that of wood. Forest Service investigations[1] show that in general 1 pound of coal has a heating value equivalent to 2 pounds of seasoned wood. Allowing 80 cubic feet of solid wood to a standard cord (4-foot sticks in a pile 8 feet long and 4 feet high), the weight of a cord of the heavy, medium, and light woods would be about 4,000, 3,000, and 2,000 pounds, respectively, for seasoned sticks containing 15 or 20 per cent moisture. Table 12 shows the number of cords of several kinds of seasoned wood that are necessary to give approximately the same heating value as 1 ton of coal.

TABLE 12.—*Amount of wood of different species necessary to give the heating value of 1 ton of coal.*

1 cord of wood equivalent to 1 ton of coal.	1½ cords of wood equivalent to 1 ton of coal.	2 cords of wood equivalent to 1 ton of coal.
Hickory.	Shortleaf pine.	Cedar.
Oak.	Western hemlock.	Redwood.
Beech.	Red gum.	Poplar.
Birch.	Douglas fir.	Catalpa.
Hard maple.	Sycamore.	Norway pine.
Ash.	Soft maple.	Cypress.
Elm.		Basswood.
Locust.		Spruce.
Longleaf pine.		White pine.
Cherry.		

There are other factors besides heat value which affect the usefulness of the different kinds of wood for fuel. Pine, for example, has a relatively low heat value per unit volume, but it ignites readily and gives out a quick, hot flame which soon dies out. This makes it a favorite with rural housekeepers, because it is particularly adapted for hot days in the kitchen. Hickory has the highest heat value, burns evenly, and "holds the heat." Oaks come next in this respect, followed by beech, birch, and maple. In selecting wood for fuel, however, it is important to consider the much greater value which some of the species have for other uses. It is a mistake to burn

[1] "Fuel Value of Wood," by H. S. Betts and Earnest Bateman; mimeographed circular of the Forest Service, 1913.

young, sound hickory and oak except when removed to improve the stand or to make way for cultivation of the land. Usually, too, these and many other species can be sold at prices which make it unwise to use them for fuel. It is better to make the farm firewood out of the species that are less salable.

Lumber.—It is probable that much more of the lumber used in farm buildings is bought in the general market than is sawed from woodlots. A considerable amount of woodlot material still goes into buildings, however, especially in the newer agricultural regions. It is here that the economy of the woodlot appears to good advantage. At times when farm work is not pressing, as in the winter, the farmer can saw enough of his trees into logs to make the required amount of lumber, haul them to some nearby mill which does "custom sawing," and have them manufactured into lumber for $3 or $4 per thousand board feet. Since at certain seasons of the year the men and teams of the farm are apt to be free from other work, the cost of the labor involved is a negligible item. The saving may thus amount to as much as two-thirds or three-fourths of the cost of even the lower grades of lumber available on the general market.

As a rule, however, the woodlot affords only a small amount, if any, of the kinds of lumber which ought to go into buildings. It is common to find farmers putting various hardwoods into barn lumber. The loss is a double one. Hardwood lumber is much less adapted to building than softwood, like pine or hemlock. The work is harder and the building less satisfactory. At the same time some of the hardwoods are especially fitted for uses for which softwoods can not be employed, and when markets are available the farmer may be able to sell his best hardwood logs or lumber at a high price, more than sufficient, possibly, to pay for the amount of softwood lumber needed. Where the market for hardwood material is poor, however, and even in some cases when it is good, the possibility of utilizing idle teams may justify the farmer in putting his hardwood logs into building lumber. When the woodlot contains softwood timber the saving is unquestionable.

PROTECTION.

If trees on the farm gave no wood for home consumption and none for sale their value for protection and shelter alone would often be great enough to justify their preservation. In the Northern States, where cold winter winds are a source of discomfort or damage, the woodlot goes a long way toward increasing the comfort of farm life. Even when leafless, a small woodlot will break the force of a strong wind; and in summer, when the leaves are on the trees, the obstruction to wind is much greater. Both live stock and crops benefit from protection against hot, drying winds.

For crop protection the woodlot must be properly located. In the absence of native timber, windbreaks, which are woodlots in narrow strips, were extensively planted for crop protection by the early settlers in the great plains region. The results did not look satisfactory to the farmers, because it was noticed that near the windbreak the grain was stunted and poor, and a revulsion of feeling against timber belts took place. There is not so much planting as formerly, and in one State—Kansas—legislative action has been taken providing that all hedge fences along the public highway shall be cut and trimmed to not more than 5 feet high, except when protecting orchards, vineyards, and feed lots.[1]

To find out as accurately as possible the relation between benefit and injury to farm crops from windbreaks, a detailed study of this subject was made in 1908 by the Forest Service.[2] Careful measurements were made at different distances from windbreaks of various species to determine, on the one hand, the amount of harm done to adjacent crops by shading, the sapping of soil moisture, and other causes; and on the other hand, the amount of benefit due to protection from evaporation, the breaking of the mechanical force of the wind, etc. At the same time, the solid contents of the trees were measured and their value as wood determined. The results of the study showed a good deal of variation among windbreaks of different species and different degrees of density, and between rows running in north-and-south as compared with east-and-west directions. In general they showed that while dense windbreaks do considerable damage to crops standing close to them—to a distance of once or twice the height of the tree—their protection from drying winds will ordinarily increase the grain yields farther away, to a distance of 10 or 12 times the tree height—more than enough to make good the loss. The protection is especially noticeable after heavy winds, which in the absence of efficient windbreaks often ruin entire fields of grain. The greatest direct benefit is obtained when the windbreaks are not closer together than a distance equal to twenty times their height. Orchard trees close to windbreaks are injured by shading and sapping, while those farther away are benefited by protection from breakage, drought, and freezing.

The economic value of windbreaks is determined not only by the prevalence of damaging winds in a region, but also by climatic factors affecting the growth of the trees themselves and the productiveness of the windbreak as a source of timber supply. Windbreaks very commonly occupy soils of agricultural value; and since an effective windbreak must consist of more than a single row of trees, the

[1] General Statutes of Kansas, 1901, secs. 3116–3118. The adoption of this statute is left to popular vote in each county.

[2] "Windbreaks: Their Influence and Value," by C. G. Bates, Forest Service Bulletin 86, 1911; and "The Windbreak as a Farm Asset," by C. G. Bates, Farmers' Bulletin 788.

area occupied is considerable. This should be considered in starting windbreaks. Planting them on an extensive scale to protect large areas is justified when their combined protective and timber value can be expected to equal or exceed the value of field crops which might be grown on the same area.

The relative value of the direct and indirect benefits of timber units is determined by the moisture conditions of the climate. Where, as in all the eastern States except parts of the Lake States and most of Iowa, the annual precipitation is over 30 inches, the crop protection is small, and windbreaks may be positively injurious around poorly drained farm land, but for orchard and home protection their value may be great enough to justify their existence, even without considering their wood-producing value. Where the annual precipitation is less than 30 inches the value of protection to crops is likely to be greater.

AS A POOR-LAND CROP.

On poor soils and on slopes too steep for successful cultivation, timber affords an excellent means of getting at least a moderate income. One objection often raised against woodlots is that trees take too long to mature, so that the owner can not hope to realize on his investment if it involves raising the stand from its youth. Even if the wood crop can be harvested only once in a lifetime, however, a net income may often be obtained which will represent as high an interest rate on the investment as other farm crops raised on better soils.

There are two general ways of managing a timber crop, depending upon whether the woodlot is to be maintained for its indirect benefits to the farm, the wood yield being a secondary but important object, or whether it is to be managed primarily as a wood-raising investment. In the first case, the farmer would keep his woodlot intact, cutting a few trees here and there as they reached large, merchantable size, and supplying himself with fuel from their branches and from defective or crowded trees removed from time to time to keep the stand in a good, rapid-growing condition. If care is taken to prevent overcutting, overgrazing, and fire, and if a good undergrowth of desirable species is encouraged, the stand can thus be perpetuated indefinitely, and the farmer can afford to raise some trees of high value but slow growth, like hickory and white oak, as well as large trees of more rapid-growing species, like black walnut and yellow poplar. If financial profit from the sale of wood products is the chief aim, a safe margin of income over all costs of raising and marketing must be reasonably certain. The cost of raising timber includes planting (if this is done), subsequent upkeep, and taxes. In addition, some charge must be made against the use of the land,

which is small in situations not adapted to cultivation. As a rule the cost of raising timber is very small compared with the cost of raising other farm crops. Where a young stand already exists and no planting expense is involved, there are several species of trees which will yield a profit provided they are adapted to the soil and climate. Within a moderate hauling distance of a steady market for wood products, as in parts of New England, planting can be and is practiced on lands of low agricultural value with fair assurance of a good profit.[1]

Under average conditions it has been shown that a few of the best species for woodlots, raised from seedlings to financial maturity on land worth $5 or $10 per acre, should yield incomes at the following rates of compound interest:[2]

	Per cent.
Cottonwood, on favorable soils	6 or 7
Loblolly pine, on the most favorable soils	2 to 11
Loblolly pine, on less favorable soils	0.8 to 5
White pine, on the most favorable soils	4 to 10
White pine, on less favorable soils	2 to 7
White ash, on favorable soils	5 to 10

These rates vary chiefly with the distance from market and the prices which can be obtained for lumber of the qualities supplied. The closer the stand is to the market the higher the lumber prices to be expected; and the better the soil and moisture conditions for rapid growth the higher will be the interest rate on the investment. Even the lower interest rates indicated above compare favorably with crop incomes in many farming regions.[3]

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[1] In choosing between species to be planted or favored in woodlots the two qualities to be sought are rapidity of growth under the existing conditions of soil and climate and high market value when cut. Since the market value can not be estimated in advance with accuracy, rapidity of growth is the more important consideration; but of two rapid-growing species the one whose wood seems likely to fill the greatest variety of industrial needs should, of course, be chosen. The time when the timber must be cut in order to yield the highest net profit is that at which the greatest difference exists between the sale value of the products and the accumulated cost, at compound interest, of planting, care and protection, and taxes. Compared with the great age which many kinds of trees reach in nature, this period of "financial maturity" comes early. It is commonly attained at from 40 to 60 years of age, though sometimes earlier with rapid-growing species on good soil and later with slower-growing species on poor soil. With especially rapid-growing species, like loblolly pine, the rotation of maximum income may be as short as 20 years under the best conditions. Information relating to tree species for woodlot use is contained in detail in Department of Agriculture Farmers' Bulletin 711, "The Care and Improvement of the Woodlot," which can be secured on application to the Secretary of Agriculture, Washington, D. C.

[2] This subject is treated at length, for various species, in the following bulletins of the Department of Agriculture:

Bul. 11, "Forest Management of Loblolly Pine in Delaware, Maryland, and Virginia."

Bul. 13, "White Pine Under Forest Management."

Bul. 24, "Cottonwood in the Mississippi Valley."

Bul. 299, "The Ashes: Their Characteristics and Management."

[3] See Department of Agriculture Bulletin 41, "A Farm-Management Survey of Three Representative Areas in Indiana, Illinois, and Iowa," by E. H. Thomson and H. M. Dixon.

The care of woodlots requires practically no work beyond the amount necessary to get out the year's supply of firewood, posts, etc., which, as thinnings and "improvement cuttings," may be made to improve the condition of the stand. The value of wood cut and sold therefore comes nearer to being a net value than that of grain crops, a large part of which each year is the cost of labor. While the gross returns per acre from most crops are usually larger than from wood the two are really much closer together when the labor cost is deducted. Furthermore, the woodlot is ready for cutting at any season, so that farm labor can be utilized on it when unoccupied with other farm work, as in the winter. There is little risk of loss from wind storms, heavy rains, hail, frosts, or droughts; and, in addition, the farmer has the advantage of wood for farm use ready at hand, of protection to adjacent crops, to stock, and, possibly, to buildings, and of by-products which the woodlot affords, such as maple sugar, nuts, etc., all of which tend to increase the selling value of farm property.

The value of land which can be used for woodlot purposes, judged from the standpoint of wood production alone, would be the capitalized value of the net income to be expected each year. The computation is practically the same as for any field crops. It consists simply in dividing the estimated net annual income by the desired rate per cent. In the following table net incomes of from 25 cents to $3 per acre per year are capitalized at 3, 4, 5, and 6 per cent, and the result in each case represents the true valuation of the land which will produce the corresponding net annual income per acre:

TABLE 13.—*Values of land for wood raising, representing net annual incomes of various amounts capitalized at 3, 4, 5, and 6 per cent.*

Net income per acre per year from the woodlot.	Land values, capitalized at—			
	3 per cent.	4 per cent.	5 per cent.	6 per cent.
$0.25	$8.33	$6.25	$5.00	$4.17
$0.50	16.67	12.50	10.00	8.33
$0.75	25.00	18.75	15.00	12.50
$1.00	33.33	25.00	20.00	16.67
$1.50	50.00	37.50	30.00	25.00
$2.00	66.67	50.00	40.00	33.33
$2.50	83.33	62.50	50.00	41.67
$3.00	100.00	75.00	60.00	50.00

Since the net income is only the amount remaining after deducting all costs of labor, interest, taxes, etc., it is not an easy figure to determine. It depends also upon the amount of wood produced each year on each acre of woodlot, which is the amount that could be removed without cutting into the producing capital of the woodlot. For example, a farmer finds out that his wood is growing at the rate

of 2 cords of "stove wood" (16-inch lengths) per acre per year and proceeds to cut and sell this amount each year. Although he does the cutting and hauling at times when his men and teams would otherwise be idle, he decides to figure the cost as though he actually paid to have the work done and finds the cost to be $3.50 per cord, delivered. He sells his wood at the rate of $4.50 per cord, clearing $1 on each cord sold. Since the annual growth per acre is 2 cords the income amounts to $2 per acre. Arbitrarily deducting 50 cents to cover one year's taxes and interest per acre, the remainder, $1.50, represents his net income. Capitalizing this at 5 per cent (see Table 13) he finds that the producing value of his land for the wood crop is $30 per acre. A very little figuring of the costs and values of other crops which might be raised on the same soil will enable him to decide whether, from a standpoint of direct income only, he is justified in keeping the land under timber. The indirect values already discussed should, of course, greatly influence his decision.

The possibilities in regard to marketing the products of the woodlot naturally differ a great deal in different regions.[1] They are best, as a rule, in thickly settled regions, where there are good roads and railroads, a large variety of manufacturing plants using wood, and better chances for securing competitive bidding for the products in the woodlot. Industries manufacturing cooperage, handles, spokes, hubs, basket and box veneer, novelties, spindles, etc., often present a better market for logs and short bolts than could be obtained if the trees were sawed up for lumber; although good logs of oak, yellow poplar, basswood, etc., may bring high prices at established mills for the production of high-grade lumber for furniture, finish, patterns, and other uses. Plants manufacturing special articles often employ buyers skilled in judging timber for the use for which they wish it, who travel through the farming sections buying in-

[1] Farmers are usually much better versed in selling other farm crops than in selling wood, and so when the wood crop is sold the problems which are involved in getting the best returns from it are likely to be perplexing. Furthermore, when the wood crops are many years apart the success of the undertaking depends a great deal more on getting a good price for the product than is the case with ordinary crops, with which a single bad bargain will affect only a single year. Before selling woodlot material, therefore, the farmer ought to obtain all the information possible on the following points: The local and distant markets and the shipping rates to them; the prices which different markets will pay for the same kind of timber, together with the specifications of each market as to size, shape, and quality; the cost of getting out the products (whether or not the farmer expects to do his own logging); and an estimate of the amount of different kinds of standing timber in his woodlot in the most profitable units (that is, as board feet of logs or lumber, cords of bolts or bark, and number of ties, poles, posts, etc.). Through ignorance of these things many farmers have sold timber far below its real worth, while others have held stands for excessively high prices until their best trees became practically worthless through decay.

The procedure which should be followed in making sales from woodlots is not within the scope of this bulletin, but is discussed in detail in Department of Agriculture Farmers' Bulletin 715, "Measuring and Marketing Woodlot Products." In most of the eastern States free information is also available on application to the State Foresters or to the State Agricultural Experiment Stations. In some States bulletins on marketing woodlot products within the State are available.

dividual trees or even woodlots. Though it is rarely possible for the farmer to become equally proficient, it is at least to his advantage before selling to inform himself on the best paying uses for his timber, the points which influence its value for these uses, and the factors which should determine the price to be paid, such as the distance and kind of haul to the manufacturing plant, the prevailing market prices, etc. It is, of course, always advisable to obtain as many competitive bids as possible, and in doing this it often becomes possible to sell to several different buyers, each taking from the woodlot the species or form of product he especially desires and can pay the most for.

In the pioneering regions the market for woodlot products is much more limited and the prices are lower; but in spite of this the woodlot sales, as shown in Table 10, have amounted to more in these regions, through the extensive clearing practiced, than in the more settled regions. Freight rates to the more settled regions are high, and the farmers must sell, as a rule, to saw or pulp mills not very far away, delivering their logs or bolts to points along the railroad. Excelsior and box factories in these regions often buy large quantities of small or low-grade material from farmers, while lime and brick kilns take a great deal of cheap fuel wood at a small price. These small returns, however, may be indispensable to the settler for maintaining a living until crops can be grown on the land cleared.

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